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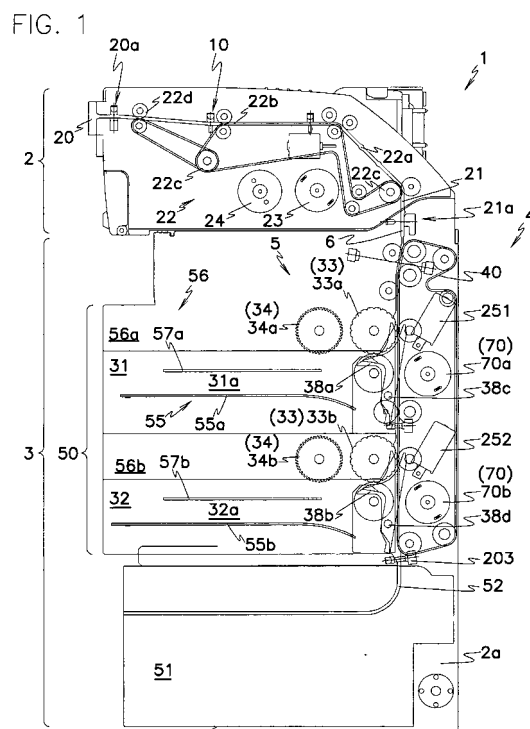
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(54) **PAPER SHEET HANDLING DEVICE**

(57) A document handler is provided that comprises a validator 2 having a main conveyor 4, a stacker 3 having a storage 50 detachably attached to validator 2, a storage conveyor 5 in storage 50 for stowing a document fed from validator 2 into storage 50 and picking out the document stored in storage 50 to validator 2 through main conveyor 4 to issue picked document from validator 2, a reversible motor 70 in main conveyor 4 drivingly and detachably connected to storage conveyor 5 of storage 50.



Description

[Patent Document 2] Japanese Patent Disclosure
No. 11-339100, Figures 1, 8, 28, 46 and 47

TECHNICAL FIELD

[0001] This invention relates to a document handler that comprises a validator and a stacker provided with a storage detachably attached to the validator to store documents in the storage, discharge the stored documents from the storage and dispense them from the validator.

BACKGROUND OF THE INVENTION

[0002] Patent Document 1 below listed discloses an automated teller machine that comprises a front operation panel for depositing into and dispensing bills out of the teller machine, a plurality of small validators for validating authenticity, denomination and defacement of bills and counting bills, a plurality of cashboxes for storing a number of bills, a reject safe for collecting defaced, rejected or non-recyclable bills or etc., a plurality of escrow reservations for temporarily accumulating bills therein upon the reception, stowing the bills into the cashboxes and picking out bills of the designated amount from the cashboxes upon the payment, and serial passageways for transporting bills one by one among the front operation panel, small validators, cashboxes, reject safe and escrow reservations, wherein the serial passageways comprise a bidirectional path for transporting bills guided along the bidirectional path in the forward and adverse directions and a plurality of unidirectional paths for transporting bills guided along the unidirectional path in a single direction. This automated teller machine however is disadvantageous because it requires a larger size and a complicated structure in the paths that connect cashboxes and reject safe to bidirectional path through unidirectional paths. Also, it is inconvenient because cashboxes and reject safe cannot be removed from the machine for collection of bills therein.

[0003] Then, Patent Document 2 teaches a bill storage that comprises a plurality of stackers for bills of different denominations and a bill conveyor for transporting bills into and out of stackers along a channel for guiding bills. Bill conveyor has a door that may be opened and closed by rotating the door about a pivot provided at one end of the channel so that the door is closed to form the channel, and it is opened to approach from outside a space for forming the channel. However, this bill storage undesirably has the bill conveyor of its complicated structure that interferes downsizing of the storage and also inconveniently precludes removable attachment of any stacker to the storage.

[Prior Art Documents]

[0004]

[Patent Document 1] Japanese Patent Disclosure
No. 4-158494, Figure 1

[Summary of the invention]

[Problem to be solved by the invention]

[0005] An object of the present invention is to provide a document handler that comprises a validator and a stacker provided with a storage removably attached to the validator to stow in the storage documents inserted into and transported from the validator and also to dispense the documents in the storage. Another object of the present invention is to provide a small-sized document handler equipped with a light-weight stacker.

[Means for solving the problem]

[0006] The document handler according to the present invention, comprises a validator (2), a stacker (3) provided with a storage (50) removably attached to validator (2), and a main conveyor (4) attached to validator (2) for transporting a document along a main passageway (6) formed between validator (2) and stacker (3). Stacker (3) also comprises a storage conveyor (5) for stowing into storage (50) documents supplied from validator (2) through main conveyor (4) and also for extracting one by one documents stored in storage (50). Main conveyor (4) comprises a reversible motor (70) for driving storage conveyor (5) in stacker (3) in the selected direction. Storage (50) may be removed from validator (2) along main passageway (6) by releasing the driving connection between storage conveyor (5) and reversible motor (70).

[0007] Storage conveyor (5) may serve a dual function of firstly stowing into stacker (3) documents one by one supplied from validator (2) and secondly picking out of storage (50) documents one by one to transport them to validator (2) by means of main conveyor (4) for dispensation of documents from validator (2). Here, storage conveyor (5) is drivingly and separably connected to reversible motor (70) that may drive storage conveyor (5) so that stacker (3) may save the need of or dispense with any drive source and may therefore be produced in light-weight. When storage (50) is attached to validator (2), storage conveyor (5) in stacker (3) is automatically brought into driving connection to reversible motor (70) in main conveyor (4) to operate storage conveyor (5) systematically and organically or in conjunction with operation of main conveyor (4). Also, as storage (50) is detachably attached to validator (2), it may be separated from validator (2) to collect storage (50) for collection and counting of documents in storage (50). In addition, after storage (50) is extracted forward of and removed from validator (2), an operator may access main conveyor (4) for its easy maintenance, inspection and repair after removal of storage (50).

[Effect of the Invention]

[0008] The present invention can provide a lightweight, small-sized and highly reliable document handler of the simplified mechanism that comprises a validator and a storage that may be drawn out and removed ahead of the validator for its easy maintenance and management.

[Brief Explanation of Drawings]

[0009]

[Figure 1] A section view showing an embodiment of the document handler according to the present invention applied to a bill validating/stacking/dispensing device; [Figure 2] A perspective view of a storage removably attached to the bill validating/stacking/dispensing device shown in Figure 1;

[Figure 3] A perspective view of the storage shown in Figure 2 with deflection levers in the closed position;

[Figure 4] A section view showing a first gear train of a main conveyor in a bill validator in Figure 1;

[Figure 5] A section view showing a second gear train for stowing bills into a container in the bill validator of Figure 1;

[Figure 6] A section view showing a stack conveyor in the storage in separable driving connection to a reversible motor in the bill validator;

[Figure 7] A section view showing the deflection levers in the closed condition for blocking communication between the storage and a main passageway to transport bills to the container through the main passageway;

[Figure 8] A section view showing the deflector levers in the opened condition for allowing communication between the storage and the main passageway;

[Figure 9] A partial and longitudinal section view of the storage taken along a plane transverse or perpendicular to a paper plane of Figure 10;

[Figure 10] A partial section view of the storage showing a condition just before stowing a bill into the storage wherein the bill supplied from the validator is supported on a support plate of the storage;

[Figure 11] A section view showing the bill stowed in the storage by a pusher plate;

[Figure 12] A section view taken along a plane transverse or perpendicular to a paper plane of Figure 11;

[Figure 13] A partial section view showing the bill completely stowed into the storage;

[Figure 14] A section view showing bills introduced into the storage from the bill validator;

[Figure 15] A section view showing bills on a bottom plate in the elevated position to discharge and transport a bill from the storage toward the bill validator;

[Figure 16] A section view showing delivery and feed rollers rotated to pick out a bill from the storage toward the bill validator;

[Figure 17] A flow chart showing an operational sequence for stowing a bill into the storage;

[Figure 18] A flow chart showing an operational sequence for discharging a bill from the storage;

[Figure 19] A block diagram showing an electric circuit in a bill validating/stacking/dispensing device;

[Figure 20] A section view illustrating another embodiment of a lifter shown in Figure 9;

[Figure 21] A perspective view illustrating an interior of the lifter in Figure 20; and

[Figure 22] A perspective view illustrating a slanted bottom plate by operation of the lifter shown in Figure 20.

15 [Explanation of Symbols]

[0010] (1)• a bill validating/stacking/dispensing device (a document handler), (2)• a validator, (3)• a stacker, (4)• a main conveyor, (5)• a storage conveyor, (6)• a main passageway, (10)• a validation sensor, (20)• an inlet, (21)• an outlet, (21a)• a passage sensor, (22)• a validation conveyor, (22a)• a validation passageway, (22b)• conveyor belts, (22c)• pulleys, (22d)• idle rollers, (23)• a conveyor motor, (24)• a stack motor, (24a)• a gear, (26)• an outlet gear, (30)• a casing, (31)• a first stacker, (32)• a second stacker, (33, 33a, 33b)• feed rollers, (33c, 33d)• idle rollers, (34, 34a, 34b)• delivery rollers, (35a, 35b)• follower gears, (36a, 36b)• fourth gears, (38)• deflection levers, (38a)• an upper deflection lever (a first deflection lever), (38b)• a lower deflection lever (a second deflection lever), (38e)• a lever upper end, (38f)• a lever lower end, (39)• a lever, (39a)• a cutout, (39b)• a handle, (40)• a main conveyor belt, (41, 43, 44, 45)• pulleys, (42)• a driven gear, (46, 47, 48)• idle rollers, (49, 49a, 49b)• pinch rollers, (50)• a storage, (51)• a container, (55, 55a, 55b)• bottom plates, (56, 56a, 56b)• pusher plates, (57, 57a, 57b)• support plates, (58)• a roller, (59a, 59b)• springs, (60)• a first gear train (a first power transmission), (61, 62, 63, 64, 65)• gears, (66, 67)• pulleys, (68)• a belt, (69)• a second gear train (a second power transmission), (70)• reversible motors, (70a)• an upper reversible motor, (70b)• a lower reversible motor, (71a, 71b)• pinion, (72a, 72b, 74a, 74b, 75a, 75b)• gears, (76, 76a, 76b)• drive gears, (80)• a lifter motor, (81)• a lift cam, (81a)• a lift cam pin, (82)• a lift lever, (82a)• a lift lever pin, (82b)• a hollow, (82c)• a long opening, (83)• a rod, (83a)• a pin, (83b)• a notch, (90)• a pin, (180)• a lifter, (251)• an upper solenoid (a first actuator), (252)• a lower solenoid (a second actuator), (255)• an upper lever roller, (256)• a lower lever roller,

[BEST MODE FOR CARRYING OUT THE INVENTION]

55 **[0011]** Embodiments will be described hereinafter regarding the document handler according to the present invention applied to a bill validating/stacking/dispensing device with reference to Figures 1 to 22 of the drawings

wherein same reference symbols denote same portions in the device.

[0012] Figure 1 shows an embodiment of the bill validating/stacking/dispensing device according to the present invention that comprises a validator 2 having a frame 2a, a stacker 3 having a storage 50 and a container 51, and a main conveyor 4 secured to frame 2a of validator 2 for transporting bills along a main passageway 6 formed between validator 2 and storage 50 of stacker 3. Storage 50 comprises upper and lower stackers 31 and 32 having respectively upper and lower (first and second) storage spaces 31a and 32a, and storage 50 itself may be removably attached to frame 2a of validator 2. The embodiment of the present invention contemplates that stacker 3 comprises storage 50 for storing bills in the extractable fashion, and a single or a plurality of storage conveyors 5 for stowing into storage 50 bills supplied from validator 2 through main conveyor 4 and also for extracting bills stored in storage 50, and also contemplates that main conveyor 4 comprises a reversible motor or motors 70 to which storage conveyors 5 in stacker 3 may be in detachable and driving connection.

[0013] Validator 2 comprises an inlet 20 for receiving bills as documents to be inserted into validator 2, an outlet 21 for discharging the bill from a validation area of validator 2, a validation passageway 22a for guiding the bill transported between inlet 20 and outlet 21, a validation conveyor 22 for transporting the bill along validation passageway 22a, a stack motor 24 in validator 2 for driving a second gear train (a second power transmission) 69 (Figure 5) drivingly connected to gears 64, 65 in a container 51, an inlet sensor 20a for detecting the bill inserted or dispensed, and an outlet sensor 21a for detecting the bill discharged from the validation area. Validation conveyor 22 comprises a conveyor motor 23, a conveyor belt 22b driven by conveyor motor 23 for transporting the bill along validation passageway 22a, a plurality of pulleys 22c with conveyor belt 22b wound therearound, and a plurality of idle rollers 22d in contact to conveyor belt 22b for transporting the bill while diverting the direction of conveyor belt 22b. Conveyor motor 23 also serves to drive a main conveyor belt 40 through a first gear train (a first power transmission) 60 and a gear 26 (Figure 4) to transport the bill along a main passageway 6 in main conveyor 4. Provided along validation passageway 22a is a validation sensor 10 for detecting optical or magnetic features of the bill. As illustrated in Figure 4, rotation power of conveyor motor 23 is transmitted from a gear 23a secured on a drive shaft of conveyor motor 23 to first gear train 60, and as illustrated in Figure 5, rotation power of stack motor 24 is transmitted from a gear 24a secured on a drive shaft of stack motor 24 to second gear train 69.

[0014] Outlet 21 of validation area in validator 2 is communicated with validation passageway 22a formed in validator 2 and also with main passageway 6 formed in main conveyor 4 disposed downstream of validator passageway 22a. As shown in Figure 4, main conveyor 4 comprises an outlet gear 26 drivingly connected to first gear

train 60, a driven gear 42 meshed with outlet gear 26, a pulley 41 secured to driven gear 42, and main conveyor belt 40 wound around pulleys 41, 43, 44, 45. Main conveyor belt 40 is also wound around idle rollers 46, 47, 48 for applying tensional force to main conveyor belt 40.

[0015] As shown in Figures 2 and 3, stacker 3 comprises a plurality of pinch rollers 49, 49a, 49b rotatably mounted in stacker 3 and releasably pressed against main conveyor belt 40 on the opposite side of mating idle rollers 46, 47, 48 when stacker 3 is attached to validator 2. The bill from outlet 21 of validation passageway 22a is sent to main passageway 6 of main conveyor 4, and then, grasped between main conveyor belt 40 and pinch roller 49 to ensure transportation of the bill along main passageway 6 toward storage 50 or container 51 of stacker 3 during movement of main conveyor belt 40.

[0016] Disposed vertically under and adjacent to upper and lower stackers 31 and 32 is container 51 that stores in the non-recyclable condition bills of single kind or different kinds no storable in upper and lower stackers 31 and 32. As shown in Figure 5, an end gear 61 is engaged with second gear train 69 in validator 2 and also interlocked with an upper gear 62 for power transmission. A drive belt 68 is wound around an upper pulley 66 secured to pulley gear 62 and also around a lower pulley 67 secured to a lower gear 65. Rotation of drive belt 68 causes lower pulley 67 and gear 65 to rotate to simultaneously further transmit the rotation force to a gear 63 meshed with lower gear 65 and a container gear 64 rotatably mounted in container 51. Container gear 64 works with a container pulley attached thereto not shown in the drawings and with a container belt wound around the container pulley to drive container pulley and belt through container gear 64 so as to stow in container 51 bills sent via main conveyor 4. When a bill is transported by main conveyor 4 shown in Figure 1 toward container 51, it passes a passage sensor 203 that detects a leading edge of the transported bill to produce a detection signal to a control device (a discrimination/conveyance controller) 200 comprised of CPU or CPUs shown in Figure 19 that then provides a drive signal for stack motor 24. Thereby, stack motor 24 is rotated to drive the belt (not shown) in container 51 and introduce the non-reusable bill into container 51. After that, stack motor 24 is driven in the adverse direction to operate a stack mechanism (not shown) to store the non-reusable bill in container 51.

[0017] By way of example, the embodiment may rotate reversible motors 70a, 70b in main conveyor 4 in the one or forward direction to drive storage conveyors 5 and stock a bill fed from validator 2 into storage 50, and to the contrary, it may rotate reversible motors 70a, 70b in the adverse direction to reversely drive storage conveyors 5 and pick out bills received in upper and lower storage spaces 31a and 32a of upper and lower stackers 31, 32 to transport and dispense them through main passageway 6 from inlet 20 of validator 2. In addition, as is apparent from Figure 6, storage conveyor 5 comprises upper and lower (first and second) reversible conveyors

53 and 54. Upper reversible conveyor 53 comprises a follower gear 35a detachably engaged with drive gear 76a driven by upper reversible motor 70a in main conveyor 4, and feed and delivery rollers 33a, 34b driven by follower gear 35a for transportation of bills into upper storage space 31a of upper stacker 31. Likewise, lower reversible conveyor 54 comprises a follower gear 35b detachably engaged with a drive gear 76b driven by lower reversible motor 70b in main conveyor 4, and feed and delivery rollers 33b, 34b driven by follower gear 35b for transporting bills into lower storage space 32a of lower stacker 32. Collectively herein referred to as reversible motors 70, feed and delivery rollers 33, 34, follower gears 35, drive gears 76 and pinch rollers 49 are respectively reversible motors 70a, 70b, feed and delivery rollers 33a, 33b, 34a, 34b, follower gears 35a, 35b, drive gears 76a, 76b and pinch rollers 49a, 49b. In this way, reversible motors 70 may work with or drive storage conveyors 5 drivingly connected to reversible motors 70, and storage conveyors 5 may be detached from reversible motors 70 when storage 50 is removed from validator 2. Accordingly, storage 50 may be made in its reduced weight because storage conveyors 5 dispense with their own power source.

[0018] In this way, storage conveyors 5 in stacker 3 are driven in bidirectional ways by reversible motors 70, to drive each storage conveyor 5 in the forward direction in order to store in upper or lower storage 31a or 32a of upper or lower stacker 31 or 32 bills fed from validator 2 and to drive each storage conveyor 5 in the adverse direction in order to extract bills from upper or lower storage 31a or 32a of upper or lower stacker 31 or 32 and send it by main conveyor 4 to validator 2 for dispensation. When storage 50 is attached to validator 2, storage conveyors 5 in stacker 3 are automatically brought into driving connection to reversible motors 70 in main conveyor 4 to drive storage conveyors 5 systematically and organically or in conjunction with operation of main conveyor 4. Also, as storage 50 is detachably attached to frame 2a of validator 2, it may be separated from validator 2 to collect and count bills in upper and lower storage spaces 31a and 32a of upper and lower stackers 31 and 32. In addition, after storage 50 is extracted ahead of and removed from frame 2a of validator 2, an operator may access main conveyor 4 for its easy maintenance, inspection and repair. Thus, the present invention may provide a lightweight, small-sized and highly reliable bill validating/stacking/ dispensing device with its simplified mechanism because it comprises storage 50 removable ahead of the device for its easy maintenance and management.

[0019] As shown in Figures 1 to 3, storage 50 comprises a metallic or plastic casing 30 for making up an outer shell of storage 50 removably fit within frame 2a of validator 2, and upper and lower (first and second) stackers 31 and 32 respectively mounted vertically and immediately adjacent to each other at upper and lower portions in casing 30. For example, upper and lower stackers 31

and 32 may store bills of the specific and/or different denomination in the extractable fashion in their upper and lower storage spaces 31a and 32a.

[0020] As is illustrated in Figures 6 to 9, storage 50 comprises upper and lower stackers 31 and 32 each of which has a storage conveyor 5 that comprises feed rollers 33a, 33b for putting bills from main passageway 6 in upper and lower stackers 31, 32, delivery rollers 34a, 34b for taking out bills from upper and lower stackers 31, 32 to main passageway 6, support plates 57a, 57b for defining upper or lower storage 31a, 32a for stored bills, bottom plates 55a, 55b for supporting bills under support plates 57a, 57b, and pusher members 56a, 56b arranged above support plates 57a, 57b for stowing bills into upper or lower storage 31a, 32a when support plates 57a, 57b are upwardly moved. In this description, bottom plates 55, support plates 57 and pusher members 56 respectively typically denote upper and lower bottom plates 55a, 55b, upper and lower support plates 57a, 57b and upper and lower pusher members 56a, 56b.

[0021] As shown in Figure 1, provided in upper and lower stackers 31, 32 are feed rollers 33a, 33b in contact to main conveyor belt 40 to grasp a transported bill between feed rollers 33a, 33b and main conveyor belt 40. Reversible motors 70a, 70b are operated to simultaneously drive feed rollers 33a, 33b and delivery rollers 34a, 34b in upper and lower stackers 31, 32.

[0022] As shown in Figures 1 to 3, 7 and 8 and 16 to 18, upper and lower stackers 31, 32 each comprise upper and lower (first and second) deflection levers 38a and 38b each movable between their opened and closed positions. Specifically, upper and lower deflection levers 38a and 38b are in the opened position to guide a bill supplied from validator 2 through main passageway 6 into upper and lower stackers 31, 32 and also to guide a bill discharged from upper and lower stackers 31, 32 through main passageway 6 to validator 2. To the contrary, upper and lower deflection levers 38a and 38b are in the closed position to block passage of a bill between upper or lower stacker 31, 32 and main passageway 6, however, they are designed in the closed position neither to project into main passageway 6 nor to block a bill from being stowed into the opened stacker or container 51 or a bill from being taken out from the opened stacker. Upper and lower deflection levers 38a and 38b are herein collectively referred to as deflection levers 38. Upper and lower deflection levers 38a and 38b are pivoted respectively around upper and lower shafts 38c and 38d for their rotation between the opened and closed positions.

[0023] Figures 7 and 8 illustrate main conveyor 4 that comprises an upper solenoid (a first actuator) 251 for shifting upper deflection lever 38a between the opened and closed positions through an upper intermediate lever 253 (Figure 7) rotatably mounted around a shaft 260 attached to main conveyor 4, a lower solenoid (a second actuator) 252 for shifting lower deflection lever 38b between the opened and closed positions through a lower intermediate lever 254 rotatably mounted around a shaft

261 attached to main conveyor 4, an upper spring 257 for resiliently urging upper intermediate lever 253 toward an inoperative position to elastically push upper deflection lever 38a toward the closed position, and a lower spring 258 for resiliently urging lower intermediate lever 254 toward an inoperative position to elastically push lower deflection lever 38b toward the closed position. Attached at the bottom end of upper intermediate lever 253 is an upper lever roller 255 in contact to upper deflection lever 38a, and also, attached at the bottom end of lower intermediate lever 254 is a lower lever roller 256 in contact to lower deflection lever 38b. Collectively referred herein to as solenoids 261, intermediate levers 262, springs 263 and lever rollers 264 are respectively upper and lower solenoids 251 and 252, upper and lower intermediate levers 253 and 254, upper and lower springs 257 and 258 and upper and lower lever rollers 255 and 256.

[0024] When upper solenoid 251 is activated, upper intermediate lever 253 is rotated in the clockwise direction around shaft 260 against resilient force of upper spring 257, and simultaneously upper lever roller 255 pushes upper lever end 38e into upper storage space 31a of upper stacker 31. This causes upper deflection lever 38a to rotate around upper shaft 38c in the clockwise direction from the closed position shown in Figure 7 to the opened position shown in Figures 1 and 8 so that a tip of upper deflection lever 38a comes into main passageway 6. Adversely, when upper solenoid 251 is deactivated, upper intermediate lever 253 is rotated in the counterclockwise direction around shaft 260 by virtue of elastic force of upper spring 257 to separate upper lever roller 255 from upper lever end 38e; then upper deflection lever 38a is rotated in the counterclockwise direction by an elastic force of a spring not shown from the opened to the closed position; and the tip of upper deflection lever 38a is retracted out of main passageway 6 (Figure 7).

[0025] In a similar manner, when lower solenoid 252 is activated, lower intermediate lever 254 is rotated around shaft 261 in the clockwise direction against elastic force of lower spring 258 so that lower lever roller 256 pushes lower lever end 38f into lower storage space 32a of lower stacker 32. This causes lower deflection lever 38b to rotate around upper shaft 38c in the clockwise direction from the closed to the opened position so that a tip of lower deflection lever 38b comes into main passageway 6 (Figures 1 and 8). Adversely, when lower solenoid 252 is deactivated, intermediate lever 254 is rotated in the counterclockwise direction around shaft 261 by virtue of elastic force of lower spring 258 to separate upper lever roller 255 from upper lever end 38e; then lower deflection lever 38b is rotated in the counterclockwise direction by an elastic force of a spring not shown from the opened to the closed position; and the tip of lower deflection lever 38b is retracted out of main passageway 6 (Figure 7). In this way, upper and lower deflection levers 38a and 38b may be independently rotated between the closed and opened positions by respective

operation of upper and lower solenoids 251 and 252. This arrangement may establish simple contacts between upper lever end 38e of upper deflection lever 38a and upper lever roller 255 and also between lower lever end 38f of lower deflection lever 38b and lower lever roller 256 to allow upper and lower deflection levers 38a and 38b to be separated from respectively upper and lower solenoids 251 and 252 when storage 50 is removed from validator 2. Upper and lower deflection levers 38a and 38b are used to guide and take bills in or out of respectively upper and lower storage spaces 31a and 32a of upper and lower stackers 31 and 32. Collectively referred herein as to lever ends 38g are upper and lower lever ends 38e and 38f.

[0026] Figure 6 indicates main conveyor 4 that comprises a first gear train 91a comprising an upper pinion 71a mounted on an output shaft of an upper conveyor motor 70a in upper stacker 31, an upper first gear 72a meshed with upper pinion 71a, an upper second gear 74a secured to upper first gear 72a for their integral rotation, an upper third gear 75a meshed with upper second gear 74a, and an upper fourth gear 76a meshed with upper third gear 75a. Main conveyor 4 also has a second gear train 91b that similarly comprises a lower pinion 71b mounted on an output shaft of a lower conveyor motor 70b in lower stacker 32, a lower first gear 72b meshed with lower pinion 71b, a lower second gear 74b secured to lower first gear 72b for integral rotation, a lower third gear 75b meshed with lower second gear 74b, and a lower fourth gear 76b meshed with lower third gear 75b.

[0027] Upper stacker 31 has a first driven gear train 92a that comprises an upper follower gear 35a detachably meshed with an upper drive gear 76a, an upper fourth gear 36a meshed with upper follower gear 35a, and an upper fifth gear 37a meshed with upper fourth gear 36a. Upper feed roller 33a and delivery roller 34a are integrally formed with respectively upper intermediate and fifth gears 35a and 37a. Likewise, lower stacker 32 has a second driven gear train 92b that comprises a lower follower gear 35b detachably meshed with a lower drive gear 76b, a lower fourth gear 36b meshed with lower follower gear 35b, and a lower fifth gear 37b meshed with lower fourth gear 36b. Lower feed and delivery rollers 33b and 34b are integrally formed with respectively lower intermediate and fifth gears 35b and 37b.

[0028] Figures 9 and 11 depict a lifter 180 attached to a side wall of a frame 2a in validator 2 for vertically moving support plates 57a and 57b in stackers 31, 32 of storage 50 between lowered and elevated positions in accordance with vertical movement of a rod 83 in lifter 180. As shown in Figure 9, lifter 180 comprises a lifter motor 80 attached to validator 2, a rotary disk 81 rotated by lifter motor 80, a pin 81a attached at an eccentric position away from a central axis on rotary disk 81, a lift lever 82 rotatable around a shaft 82a and formed with a notch 82b for receiving pin 81a, a pin 83a formed with rod 83 and received within an elongated hole 82c bored at an end of lift lever 82, upper and lower support plates 57a and

57b integrally formed into a generally upset H-shape in storage 50, a roller 58 formed on support plates 57a and 57b and received within a cutout 83b of rod 83, upper (first) and lower (second) bottom plates 55a and 55b each rotatable around shafts 55c, 55d within upper and lower stackers 31 and 32, and upper and lower pusher members 56a and 56b secured to casing 30 above related upper and lower support plates 57a and 57b each connected to upper and lower bottom plates 55a and 55b through springs 59a and 59b.

[0029] When lift motor 80 is rotated in the forward direction, lift lever 82 is rotated in the clockwise direction around shaft 82a through rotary disk 81 to elevate rod 83. This causes support plates 57 to travel from the lower position shown in Figure 9 toward stationary pusher members 56a, 56b to the upper position shown in Figure 11 along with rod 83 while springs 59a, 59b are expanded against their resilient force with the rise of rod 83 and support plates 57 to the upper position. Then, when a bill has completely been supplied from feed rollers 33a, 33b onto support plates 57a, 57b, they are elevated together with rod 83, and then, as illustrated in Figure 12, pusher members 56a, 56b push and stow the bill into support plates 57a, 57b onto bottom plates 55a, 55b against resilient force of springs 59a, 59b. After that, when lift motor 80 further rotates in the forward direction, lift lever 82 rotates in the counterclockwise direction to lower rod 82 and support plates 57a, 57b in unison. Here, as shown in Figure 13, springs 59a, 59b are contracted by their own elasticity while both sides of the bill are laid on bottom plates 55a, 55b.

[0030] Now, stacking operations of bills will be described hereinafter with reference to the operational sequence of flow chart shown in Figure 17. Processing moves on from START in Step 100 to 101 where control device 200 decides on whether or not inlet sensor 20a is turned on by insertion of a bill into inlet 20. When control device 200 decides reception of an electric detection signal from inlet sensor 20a by a bill insertion, it causes conveyor motor 23 to rotate in the forward direction (in Step 102). Therefore, the bill is transported along validation passageway 22a by validation conveyor 22, and validation sensor 10 converts optical or magnetic features of moving bill into electric detection signals to control device 200 that receives detection signals from validation sensor 10 to decide in Step 103 on whether bill is genuine or not. If the bill is genuine, control device 200 then decides denomination of the bill (in Step 104). As bills of different denominations are stacked in upper and lower storage spaces 31a and 32a of upper and lower stackers 31 and 32, control device 200 selectively activates related upper or lower solenoid 251 or 252 (in Step 105) to selectively rotate upper or lower deflection lever 38a or 38b from the closed to the opened position. Then, control device 200 rotates selectively upper or lower reversible motor 70a or 70b related to the selected denomination (in Step 106). Afterward, control device 200 receives a detection signal from passage sensor 21a to confirm that

the bill has passed through passage sensor 21a (in Step 107), and further it decides (in Step 108) on whether a given period of time has elapsed after passage of the bill through passage sensor 21a. Thus, the bill runs along upper or lower deflection lever 38a or 38b related to the bill denomination into upper or lower stacker 31 or 32 onto support plate 57a or 57b, and so, control device 200 turns off driven upper or lower solenoid 251 or 252 to rotate upper or lower deflection lever 38a or 38b from the opened to the closed position (in Step 109) by elastic force of spring not shown, and also control device 200 stops operation of driven upper or lower reversible motor 70a or 70b (in Step 110).

[0031] After that, control device 200 activates lifter motor 80 (in Step 111) to move rod 83 from the lower position of Figure 9 to the upper position of Figure 11. In Step 112, when a first lifter sensor 84 detects elevated rod 83, it is turned on to produce a detection signal to control device 200. When upper and lower support plates 57a, 57b are in the lower position of Figure 10, control device 200 detects turning-on of first lifter sensor 84 in Step 112, while one of upper and lower support plates 57a, 57b supports the fed bill thereon. When upper and lower support plates 57a, 57b are upwardly moved from the lower position to the upper position of Figure 12, upper or lower pusher member 56a or 56b forcibly stows the bill on upper or lower support plate 57a, 57b onto upper or lower bottom plate 55a or 55b within upper or lower stacker 31 or 32, and control device 200 detects turning-on of a second lifter sensor 85 in Step 113. Processing moves on from Step 113 to 114 where control device 200 further activates lifter motor 80 to lower rod 83, and when first lifter sensor 84 detects rod 83 in the lower position, control device 200 ceases operation of lifter motor 80 to finish the stowing operation of the bill as side edges of the bill are also in contact to bottom plate 55 as shown in Figure 13.

[0032] When control device 200 does not decide the bill to be genuine in Step 103, processing goes on from Step 130 to 116 where control device 200 drives conveyor motor 23 in the adverse direction to return the bill to inlet 20. The bill returned to inlet 20 turns on inlet sensor 20a (in Step 117) so that control device 200 stops operation of conveyor motor 23 (in Step 118). Subsequently, when an operator takes out the bill from inlet 20 (in Step 119), procedure completes the returning operation of the bill.

[0033] Then, the payment operation of bills will be described hereinafter with reference to the operational sequence of flow chart shown in Figure 18. From Step 121 of START to 122, when control device 200 receives an instruction signal to advance preparation of bill payment, it drives conveyor motor 23 in the adverse direction and at the same time turns on upper or lower solenoid 251 or 252 related to upper or lower stacker 31 or 32 that stores bills of the denomination to be dispensed (in Step 123) to rotate upper or lower deflection lever 38a or 38b from the closed to the opened position. When lifter motor

80 is then rotated in the forward direction (in Step 124), rod 83 is upwardly moved to sequentially turn on first and second lifter sensors 84 and 85 in Steps 126 and 127. Subsequently, when a given period of time is over after second lifter sensor 85 is turned on, control device 200 stops operation of lifter motor 80 (in Step 128) to maintain rod 83 in the elevated position of Figure 11 so that upper and lower bottom plates 55a, 55b are retained in the slant condition shown in Figure 15. This causes each uppermost one of bills stored in upper and lower storage spaces 31a and 32a to be in contact to feed rollers 33a, 33b to finish preparation of bill distribution. Then, as shown in Figure 16, delivery rollers 34a, 34b and feed rollers 33a, 33b are rotated to discharge the uppermost bill from upper or lower storage spaces 31a or 32a to main passageway 6.

[0034] As mentioned before, deflection lever 38 is already in the opened position, and conveyor motor 23 is rotated in the adverse direction. Here, when related upper or lower reversible motor 70a or 70b is rotated in the adverse direction in Step 129, the bill of the denomination is smoothly discharged from upper or lower storage 31a or 32a (in Step 130). Then, in Step 131, passage sensor 21a detects on whether or not the discharged bill has passed passage sensor 21a, and when passage sensor 21a is turned off during passage of the bill, it forwards the off- detection signal to control device 200 that then decides on whether or not a given period of time has elapsed after passage of the bill through passage sensor 21a (in Step 132), and when the given period of time has elapsed, control device 200 stops drive upper or lower reversible motor 70a or 70b (in Step 133).

[0035] Subsequently, control device 200 decides in Step 134 on whether it receives from passage sensor 21a an ON detection signal indicative of finished passage of the bill. When passage sensor 21a detects passage of the bill's trailing edge, processing moves on to Step 135 where control device 200 again rotates upper or lower reversible motor 70a or 70b in the forward rotation to prevent successive discharge from upper or lower storage 31a, 32a of a subsequent bill just beneath the discharged bill in order to return the subsequent bill in upper or lower storage 31a, 32a. After a certain period of time since upper or lower reversible motor 70a or 70b has been rotated in the forward direction, procedure goes on from Step 136 to 137 where control device 200 stops operation of related upper or lower reversible motor 70a or 70b, and turns off related solenoid 251 or 252 in Step 138 to advance to Step 139. Control device 200 decides in Step 139 on whether or not to again receive another instruction signal for payment, and when control device 200 receives the further instruction signal on payment, processing moves on to Step 129, but when it does not receive such a further instruction signal, control device 200 rotates lifter motor 80 in the forward rotation (in Step 140) to return rod 83 to the lower position shown in Figure 9, and then, control device 200 decides in Step 141 on whether or not a certain period of time has elapsed after

turning-off of first and second lifter sensors 84 and 85. After the certain period of time, control device 200 ceases operation of lifter motor 80 to finish the payment operation of bills.

[0036] To remove storage 50 of stacker 3 from validator 2, it is pulled forwardly of validator 2 so that follower gears 35a, 35b in storage 50 are disengaged from drive gears 76a, 76b in main conveyor 4, while simultaneously, feed rollers 33a, 33b and pinch rollers 49a, 49b in storage 50 are released from contact to main conveyor belt 40 in main conveyor 4.

[0037] As shown in Figures 2 and 4, stacker 3 comprises a lever 39 rotatably mounted on a side wall 3a of casing 30, and a cutout 39a formed in lever 39 to releaseably hook cutout 39a on a pin 90 attached to frame 2a of validator 2 to secure storage 50 to frame 2a. When a handle 39b connected to lever 39 is pulled down while rotating lever 39, cutout 39a is released from pin 90 to detach storage 50 from frame 2a.

[0038] Conversely, to attach storage 50 to validator 2, it is pushed into validator 2 so that upper and lower follower gears 35a, 35b in upper and lower reversible conveyors 53 and 54 are automatically brought into engagement with drive gears 76a, 76b in main conveyor 4, and concurrently, feed rollers 33a, 33b and pinch rollers 49a, 49b in upper and lower reversible conveyors 53 and 54 are automatically brought into contact to main conveyor belt 40 in main conveyor 4. Thus, first and second reversible conveyors 53 and 54 in first and second stackers 31 and 32 are removably and drivingly connected to upper and lower reversible motors 70a and 70b in main conveyor 4.

[0039] Figures 20 to 22 depict another embodiment of lifter 180 having its different structure from that shown in Figure 9. Shown lifter 180 comprises a lifter motor 80 attached to validator 2, a drive gear 210 mounted on an output shaft of lifter motor 80, a rotary encoder 201 integrally rotated with drive gear 210, an encoder sensor 202 for generating electric pulses during rotation of rotary encoder 201, a first follower gear 203 meshed with drive gear 210, a second follower gear 204 mounted at the opposite end on the same shaft of first follower gear 203 for their integral rotation, first, second and third intermediate gears 205, 206 and 207 interlocking second follower gear 204 in series, a lifter pinion 208 meshed with a third intermediate gear 207, and a rack gear 209 meshed with lifter pinion 208 and vertically movable during rotation of lifter pinion 208. First intermediate gear 205 is releaseably meshed with second follower gear 204 so that first intermediate gear 205 is automatically drivingly engaged with or disengaged from second follower 204 when storage 50 is attached to or removed from validator 2. In a similar manner to movement of upper and lower support plates 57a, 57b shown in Figure 9, upper and lower support plates 57a, 57b may move between the lower position shown in Figure 21 and the upper position shown in Figure 22 to stow or discharge bills on upper or lower support plate 57a or 57b. In synchronization with

upward and downward movement of upper and lower support plates 57a, 57b, upper and lower bottom plates 55a and 55b may be rotated between the horizontal and aslope conditions so that each uppermost bill stored in upper and lower stackers 31, 32 is in contact to corresponding feed rollers 33 when upper and lower bottom plates 55a, 55b are in the aslope condition at the ready for discharge of bills from upper and lower stackers 31, 32. Then, as shown in Figure 16, simultaneous adverse rotations of upper and lower feed and delivery rollers 33a, 33b, 34a and 34b cause bills to be discharged from upper and lower stackers 31 and 32 to main passageway 6. Control device 200 may receive and count pulses from rotary encoder 201 so that control device 200 may stop operation of lifter motor 80 at the desired number of pulses to stop upper and lower support plates 57a, 57b at the desired position or may drive lifter motor 80 in the forward or adverse direction to move upper and lower support plates 57a, 57b in the upward or downward directions.

[0040] The foregoing embodiments exemplify the conveyance structure for carrying bills along main passageway 6 by means of main conveyor belt 40, however, in lieu of or in addition to main conveyor belt 40, the embodiment may use combined main conveyor rollers and feed rollers and/or pinch rollers to carry bills along main passageway 6.

[Applicability in Industry]

[0041] While the foregoing description exemplifies the embodiments of the present invention applied to the bill validating/stacking/dispensing device, the invention is also applicable to any device for accepting and/or dispensing bills for bill handling apparatus such as bill validator, discriminator or acceptor or coupon acceptor.

Claims

1. (Amended) A document handler comprising a validator (2), a stacker (3) removably attached to the validator (2) and a main conveyor (4) attached to the validator (2) for transporting a document along a main passageway (6) formed between the validator (2) and stacker (3), wherein the stacker (3) comprises a storage (50) and a storage conveyor (5) for stowing into the storage (50) documents supplied from the validator (2) through the main conveyor (4) and also for extracting the documents stored in the storage (50), the main conveyor (4) comprises a reversible motor (70) for driving the storage conveyor (5) in the stacker (3), a deflection lever (38) movable between the opened and closed positions and an actuator (250) for moving the deflection lever (38) between the opened and closed positions, the stacker (3) may be removed from the validator

(2) by releasing the driving connection between the storage conveyor (5) and reversible motor (70), and the deflection lever (38) in the opened position guides the document transported between the storage (50) and main passageway (6).

2. The document handler of claim 1, wherein the storage conveyor (5) comprises a feed roller (33) for putting the document in the storage (50) from the main passageway (6) and also for discharging the document from the storage (50) into the main passageway (6), and a delivery roller (34) for picking out the document from the storage (50) into the main passageway (6), the feed and delivery rollers (33, 34) are drivingly and removably connected to the reversible motor (70).
3. The document handler of claim 2, wherein the main conveyor (4) comprises a main conveyor belt (40) or a main conveyor roller arranged along the main passageway (6), the feed roller (33, 33a, 33b) is rotatably supported in the storage conveyor (5) and also removably urged against the main conveyor belt (40) or main conveyor roller along the main passageway (6), the document transported from the validator (2) is grasped between the main conveyor belt (40) or main conveyor roller and feed roller (33, 33a, 33b) to carry the document along the main passageway (6), the feed roller (33, 33a, 33b) is separated from the main conveyor belt (40) or main conveyor roller when the stacker (3) is removed from the validator (2).
4. The document handler of claim 3, wherein the stacker (3) comprises a pinch roller (49) rotatably mounted and urged against and removably from the main conveyor belt (40) or main conveyor roller along the main passageway (6), the document transported from the validator (2) is grasped between the main conveyor belt (40) or main conveyor roller and pinch roller (49) to carry the document along the main passageway (6), the pinch roller (49) is separated from the main conveyor belt (40) when the stacker (3) is removed from the validator (2).
5. The document handler of claim 1, wherein the validator (2) comprises a validation conveyor (22) for carrying along a validation passageway (22a) the document inserted through an inlet (20) provided in the validator (2), the main conveyor (4) carries the document conveyed along the validation passageway (22a) along the main passageway (6) to the stacker (3), the storage conveyor (5) carries the document conveyed along the main passageway (6) into the stor-

age (50) in the stacker (3) when the reversible motor (70) is rotated in one direction.

6. The document handler of claim 5, wherein the storage conveyor (5) extracts the document stored in the storage (50) from the storage (50) to the main passageway (6) when the reversible motor (70) is rotated in the other direction, the main conveyor (4) carries the document extracted to the main passageway (6) to the validation passageway (22a), the validation conveyor (22) carries the document sent to the validation passageway (22a) to the inlet (20).
7. The document handler of claim 5 or 6, wherein the stacker (3) comprises a container (51) arranged in a vertically spaced relation to the storage (50) for receiving the documents sent along the main passageway (6) by the main conveyor (4) to accumulate the documents in the container (51) in the non-recyclable condition.
8. The document handler of claim 7, wherein the storage (50) comprises a support plate (57) disposed in an upper position of a storage space (86) for receiving the documents, a bottom plate (55) under the support plate (57) for supporting the documents, said bottom plate (55) being movable between the contact position for allowing contact of the document to the delivery roller (34) and the release position for keeping the document away from the delivery roller (34), and a lifter (180) for moving the bottom plate (55) from the release position to the contact position to bring the document within the storage space (86) into contact to the delivery roller (34), the delivery roller (34) is rotated to move the document in contact to the delivery roller (34) from under the support plate (57) into the main passageway (6).
9. The document handler of claim 8, wherein the lifter (180) comprises a lifter motor (80) and a rod (83) vertically movable by operation of the lifter motor (80), the vertical movement of the rod (83) causes the document supported on the support plate (57) to be stowed in the storage (50) and also causes the bottom plate (55) to be moved to the contact position to bring the document into contact to the delivery roller (34).
10. The document handler of claim 8, wherein the lifter (180) comprises a lifter motor (80), a lifter pinion (181) rotated by the lifter motor (80) and a rack gear (182) meshed with the lifter pinion (181) to be vertically moved during rotation of the lifter pinion (181), the vertical movement of the rack gear (182) causes the document supported on the support plate (57) to

be stowed in the storage (50) and also causes the bottom plate (55) to be moved to the contact position to bring the document into contact to the delivery roller (34).

11. The document handler of any one of claims 1 to 10, wherein the storage conveyor (5) comprises a follower gear (35) drivingly and separably connected to a drive gear (76) driven by the reversible motor (70) in the main conveyor (4), a main conveyor belt (40) or main conveyor roller provided in the main conveyor (4), a feed roller (33) separably urged against the main conveyor belt (40) or main conveyor roller to move the document within the stacker (3), while the feed roller (33) is driven by the follower gear (35), and a delivery roller (34) for picking out the document from the storage (50) into the main passageway (6), the feed and delivery rollers (33, 34) are rotated by operation of the reversible motor (70) via the drive and follower gears (76, 35).
12. The document handler of claim 1, wherein the document is transported from the validation passageway (22a) in the validator (2) to the main passageway (6) during the forward rotation of the conveyor motor (23), the feed and delivery rollers (33, 34) are rotated in their forward rotation during the forward rotation of the reversible motor (70) to transport the document from the main passageway (6) to the storage (50).
13. The document handler of claim 12, wherein the delivery and feed rollers (34, 33) are rotated in their adverse rotation during the adverse rotation of the reversible motor (70) to pick out the document from the storage (50) to the main passageway (6), the document is transported from the main passageway (6) to the validation passageway (22a) in the validator (2) during the adverse rotation of the conveyor motor (23).
14. (Cancelled)
15. (Amended) The document handler of claim 1, wherein the deflection lever (38) is separated from the actuator (250) when the stacker (3) is removed from the validator (2).
16. The document handler of claim 4, wherein an idle roller (46, 47, 48) is disposed at the opposed position to the pinch roller (49a, 49b) in the urged condition of the idle roller (46, 47, 48) against the main conveyor belt (40).
17. The document handler of claim 1, wherein the storage (50) comprises a first stacker (31) and a second stacker (32) disposed vertically adjacent to the first

- stacker (31),
the first stacker (31) comprises a first storage (31a),
and
the second stacker (32) comprises a second storage (31b) for accumulating the documents of different kind from those accumulated in the first storage (31a).
18. The document handler of claim 17, wherein the storage conveyor (5) comprises a first feed roller (33a) for bringing the document from the main passageway (6) into the first storage (31a), a second feed roller (33b) for bringing the document from the main passageway (6) into the second storage (31b), a first delivery roller (34a) for picking out the document from the first storage (31a) to the main passageway (6), and a second delivery roller (34b) for picking out the document from the second storage (31b) to the main passageway (6).
19. The document handler of claim 18, wherein the reversible motor (70) comprises a first reversible motor (70a) drivingly and detachably connected to the first feed roller (33a), and a second reversible motor (70b) drivingly and detachably connected to the second feed roller (33b).
20. The document handler of claim 19, wherein the first feed roller (33a) is drivingly connected to a first follower gear (35a); the first reversible motor (70a) is drivingly connected to a first drive gear (76a); the second feed roller (33b) is drivingly connected to a second follower gear (35b); the second reversible motor (70b) is drivingly connected to a second drive gear (76b); the first and second follower gears (35a, 35b) are automatically brought into driving engagement with respectively the first and second drive gears (76a, 76b) when the stacker (3) is attached to the validator (2),
the first and second follower gears (35a, 35b) are automatically detached from respectively the first and second drive gears (76a, 76b) when the stacker (3) is removed from the validator (2).
21. The document handler of claim 20, wherein the main conveyor (4) comprises a first deflection lever (38a) movable between the opened and closed positions, a first actuator (251) for shifting the first deflection lever (38a) between the opened and closed positions, a second deflection lever (38b) movable between the opened and closed positions, and a second actuator (252) for shifting the second deflection lever (38b) between the opened and closed positions,
the first deflection lever (38a) in the opened position guides the document transported between the first storage (31a) and main passageway (6),
the second deflection lever (38b) in the opened po-

sition guides the document transported between the second storage (31b) and main passageway (6).

22. The document handler of claim 21, wherein the first and second deflection levers (38a, 38b) may be detached from respectively the first and second actuators (251, 252).

23. The document handler of any one of claims 1 to 22, wherein the stacker (3) may be removed from the validator (2) along the main passageway (6).

Statement under Art. 19.1 PCT

The amended claim 1 makes clear the following features of the present invention.

The document handler according to the present invention, comprises a validator (2), a stacker (3) removably attached to validator (2), and a main conveyor (4) attached to validator (2) for transporting a document along a main passageway (6) formed between validator (2) and stacker (3). Stacker (3) comprises a storage (50) and a storage conveyor (5) for stowing into storage (50) documents supplied from validator (2) through main conveyor (4) and also for extracting documents stored in storage (50). Main conveyor (4) comprises a reversible motor (70) for driving storage conveyor (5) in stacker (3), a deflection lever (38) movable between the opened and closed positions, and an actuator (250) for moving deflection lever (38) between the opened and closed positions so that stacker (3) is removed from validator (2) by releasing the driving connection between storage conveyor (5) and reversible motor (70). Deflection lever (38) in the opened position guides documents transported between storage (50) and main passageway (6). In the document handler according to the present invention, stacker (3) may be removably from validator (2) in main passageway (6).

Stacker (3) has storage conveyor (5), actuator (250) and deflection lever (38) that work in cooperation to stow into stacker (3) documents supplied from validator (2) and pick out of stacker (3) documents already stored in stacker (3) to transport them to validator (2) by means of main conveyor (4) for dispensation of documents from validator (2).

Claim 15 becomes dependent on claim 1 because dependent claim 14 has been deleted.

FIG. 1

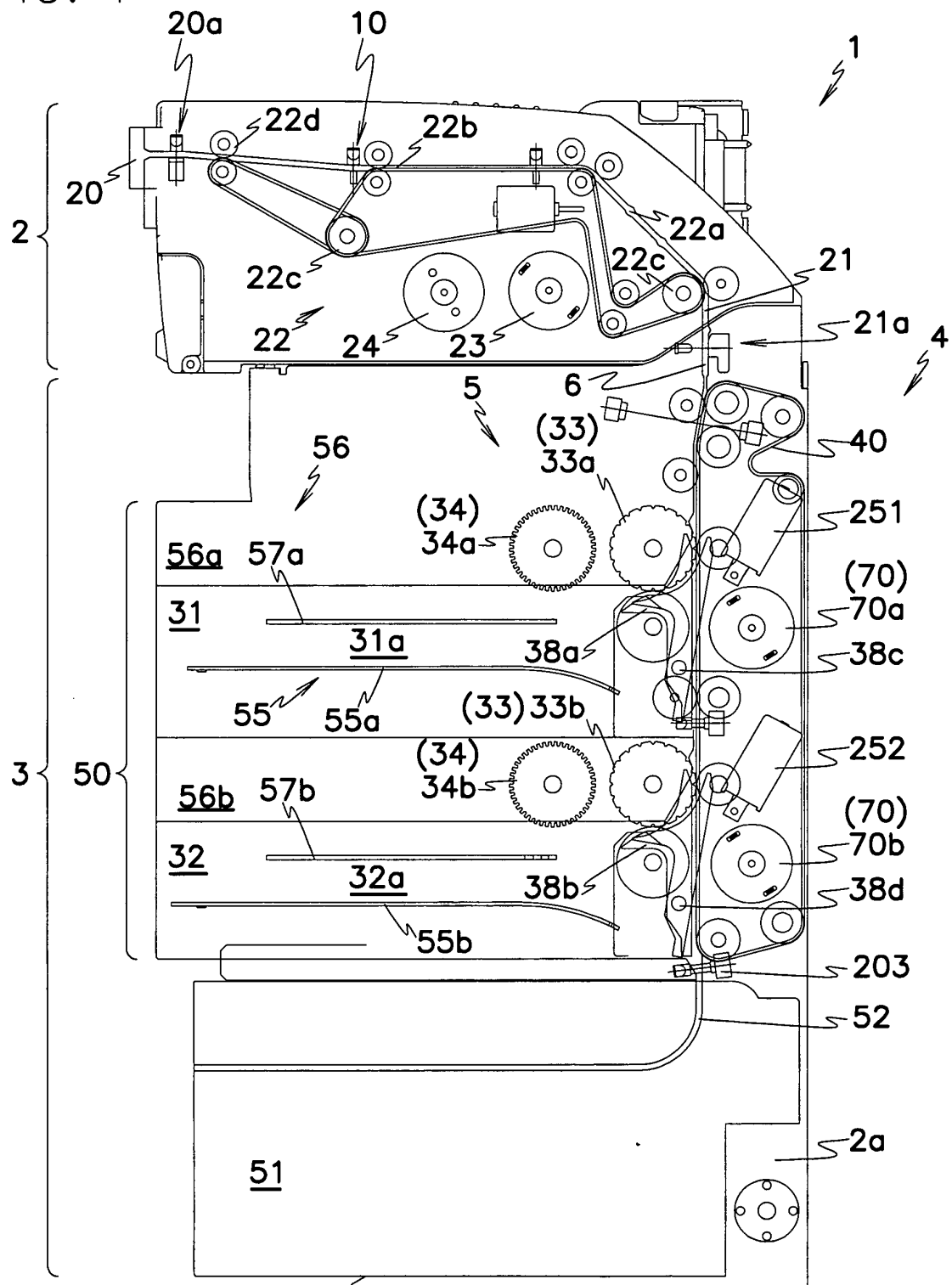


FIG. 2

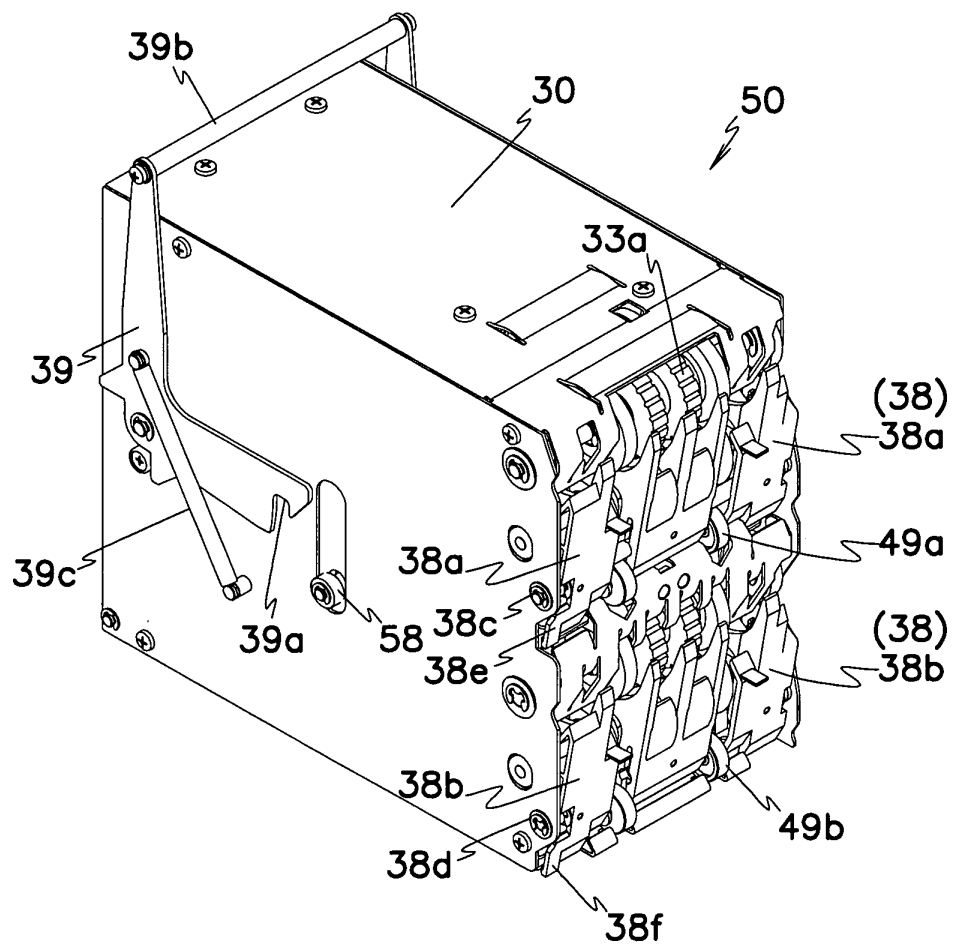


FIG. 3

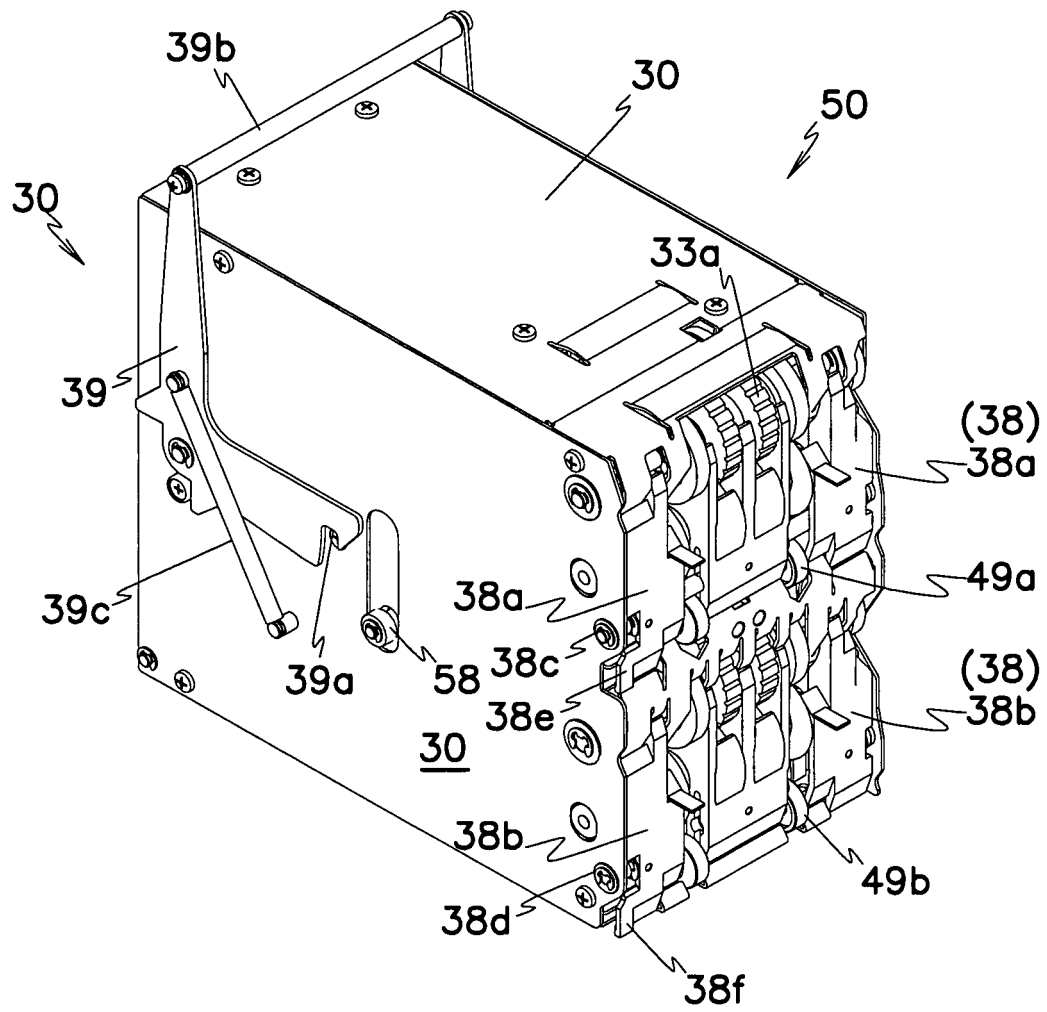


FIG. 4

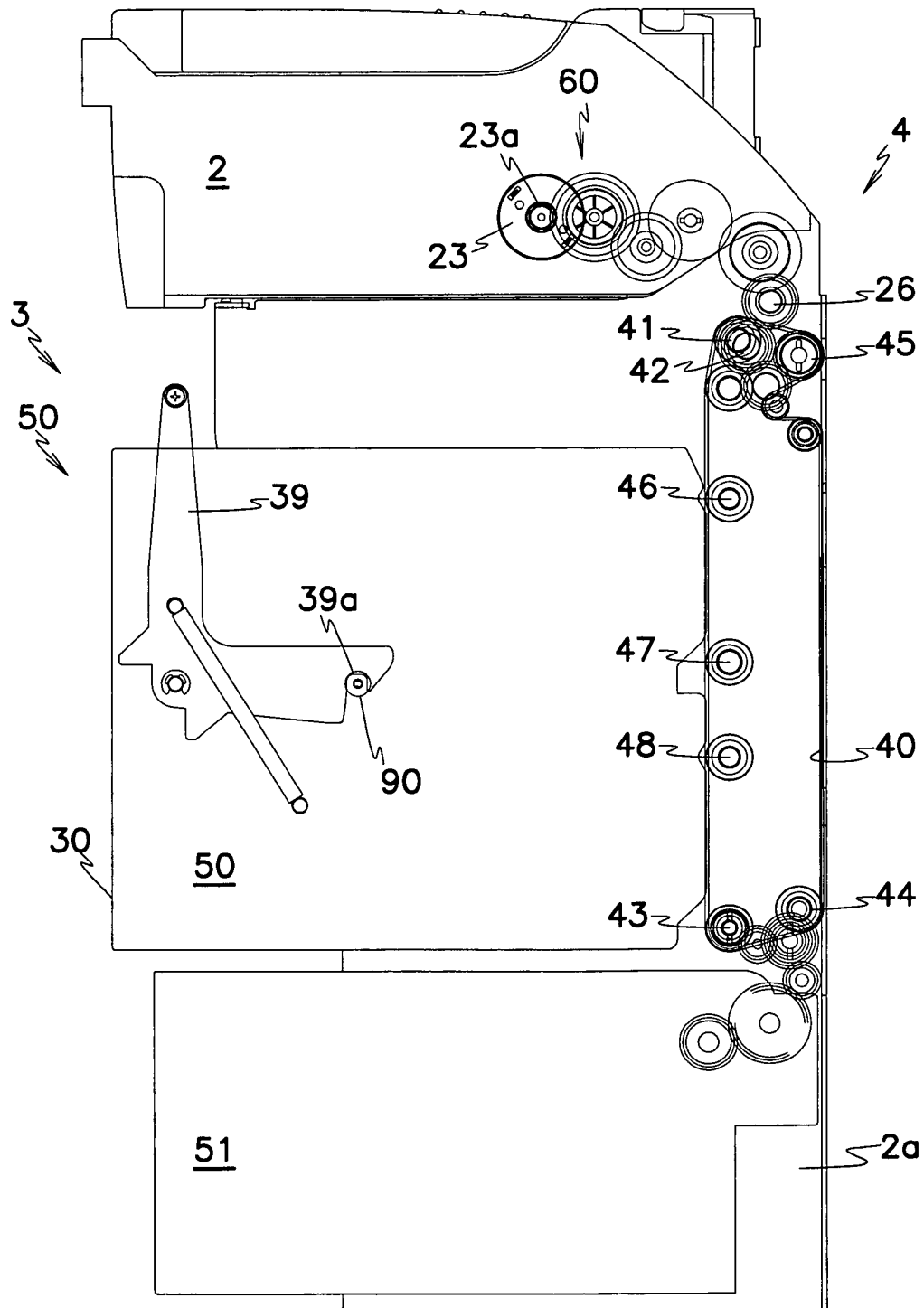


FIG. 5

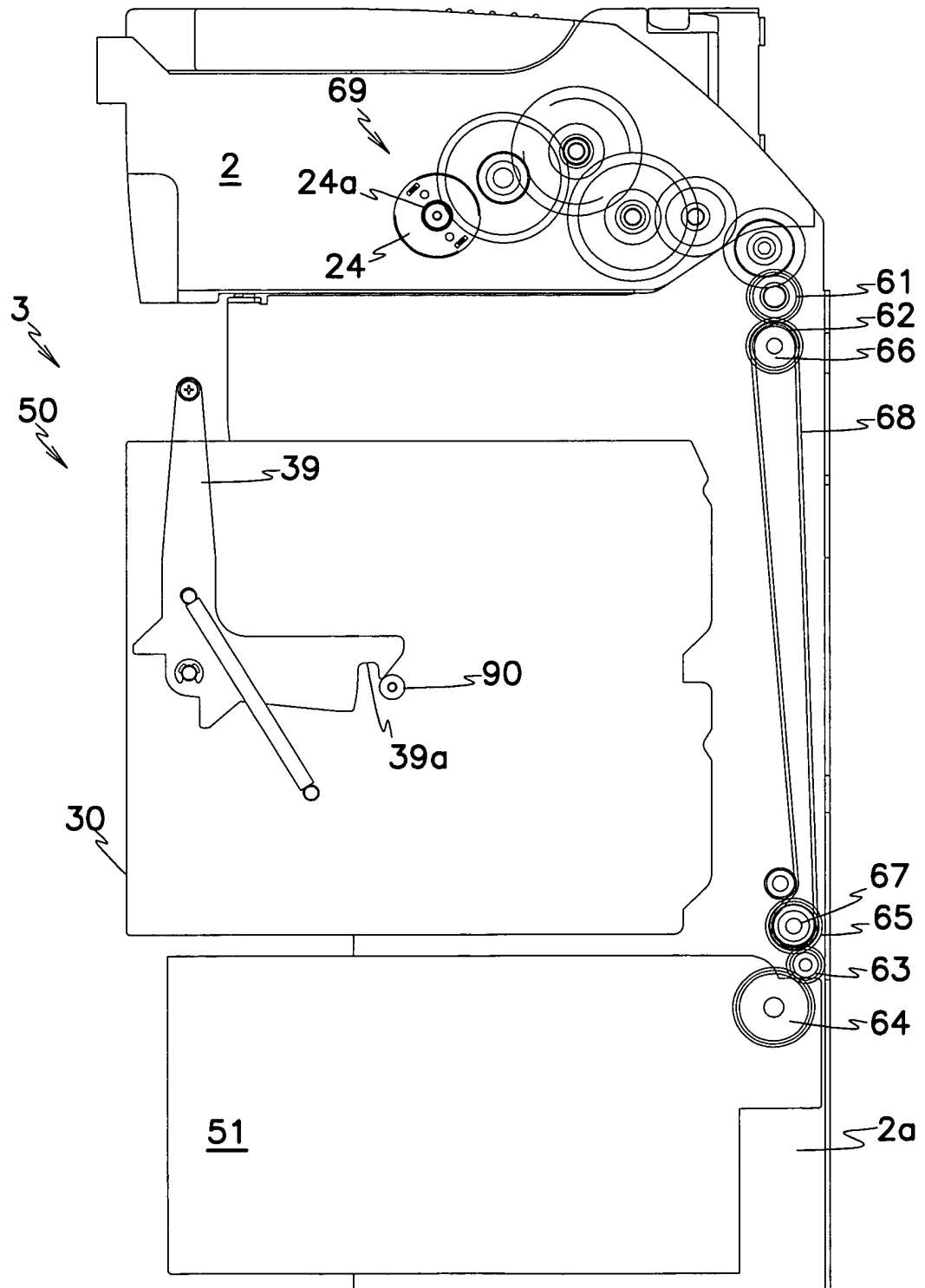


FIG. 6

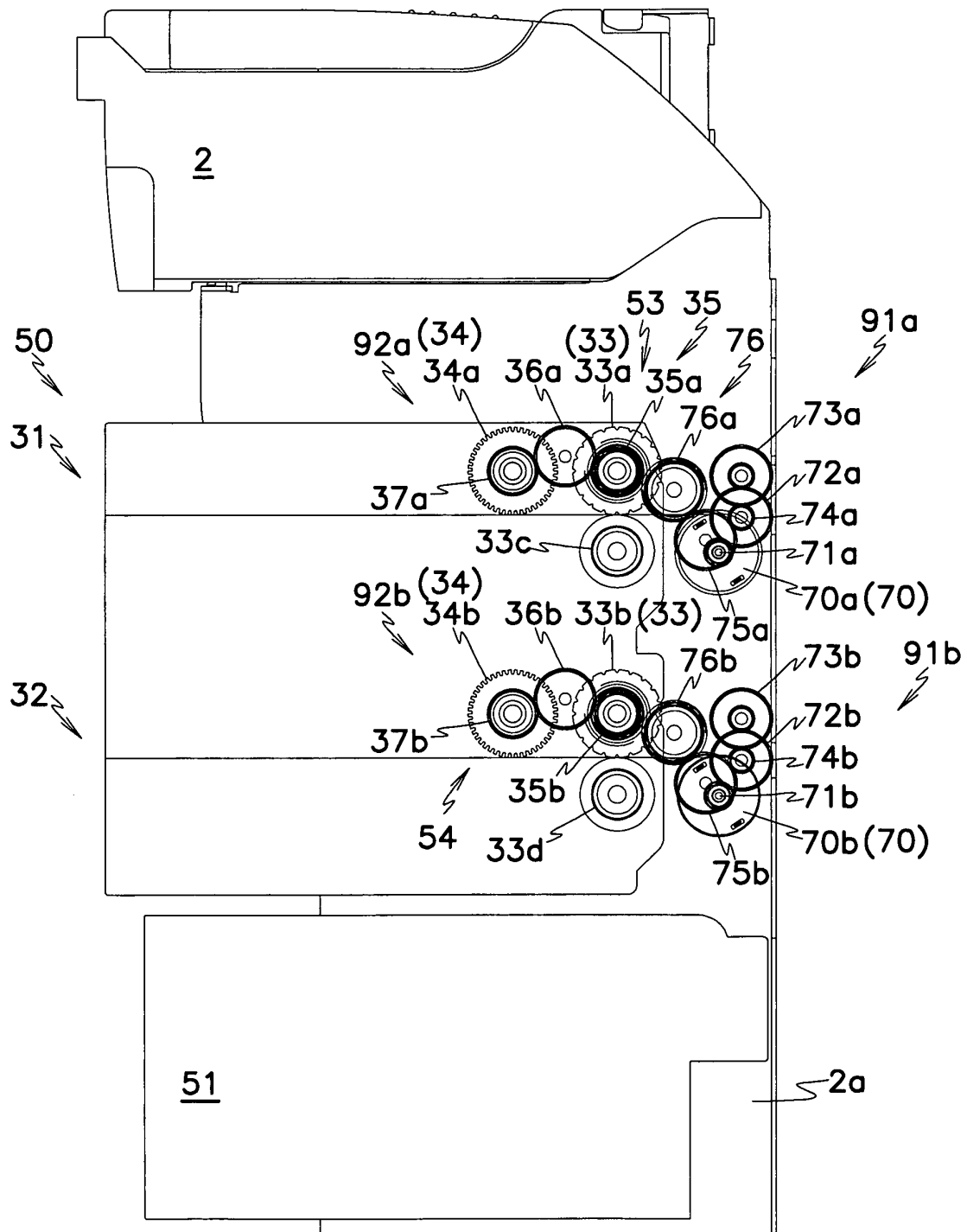


FIG. 7

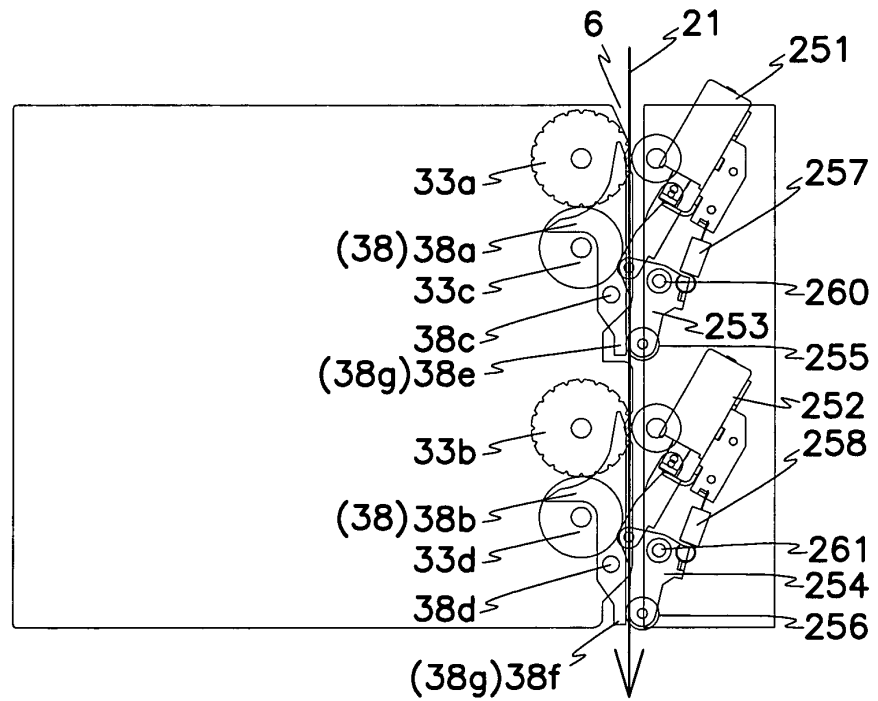


FIG. 8

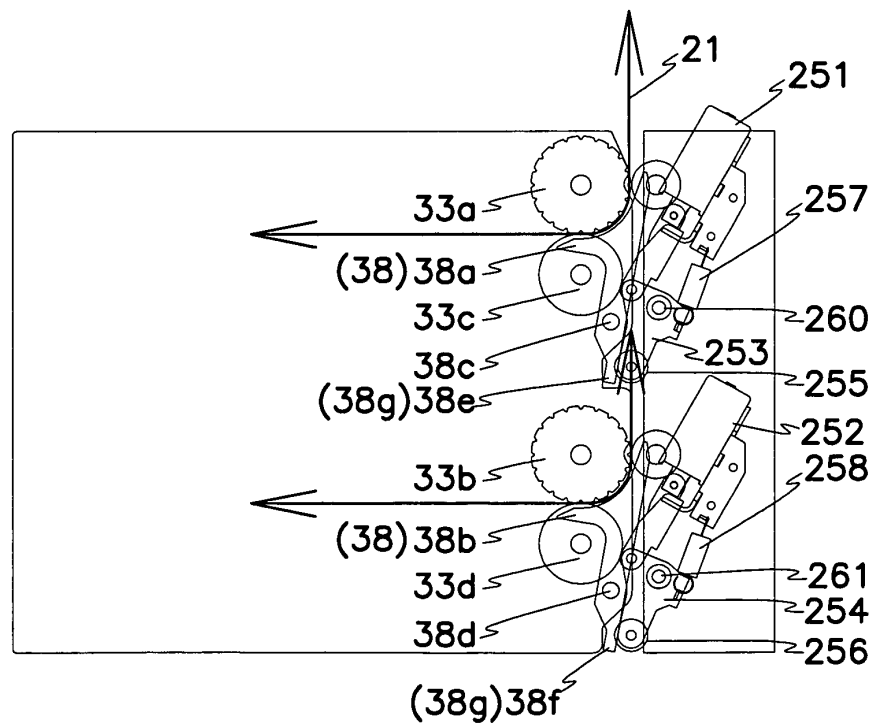


FIG. 9

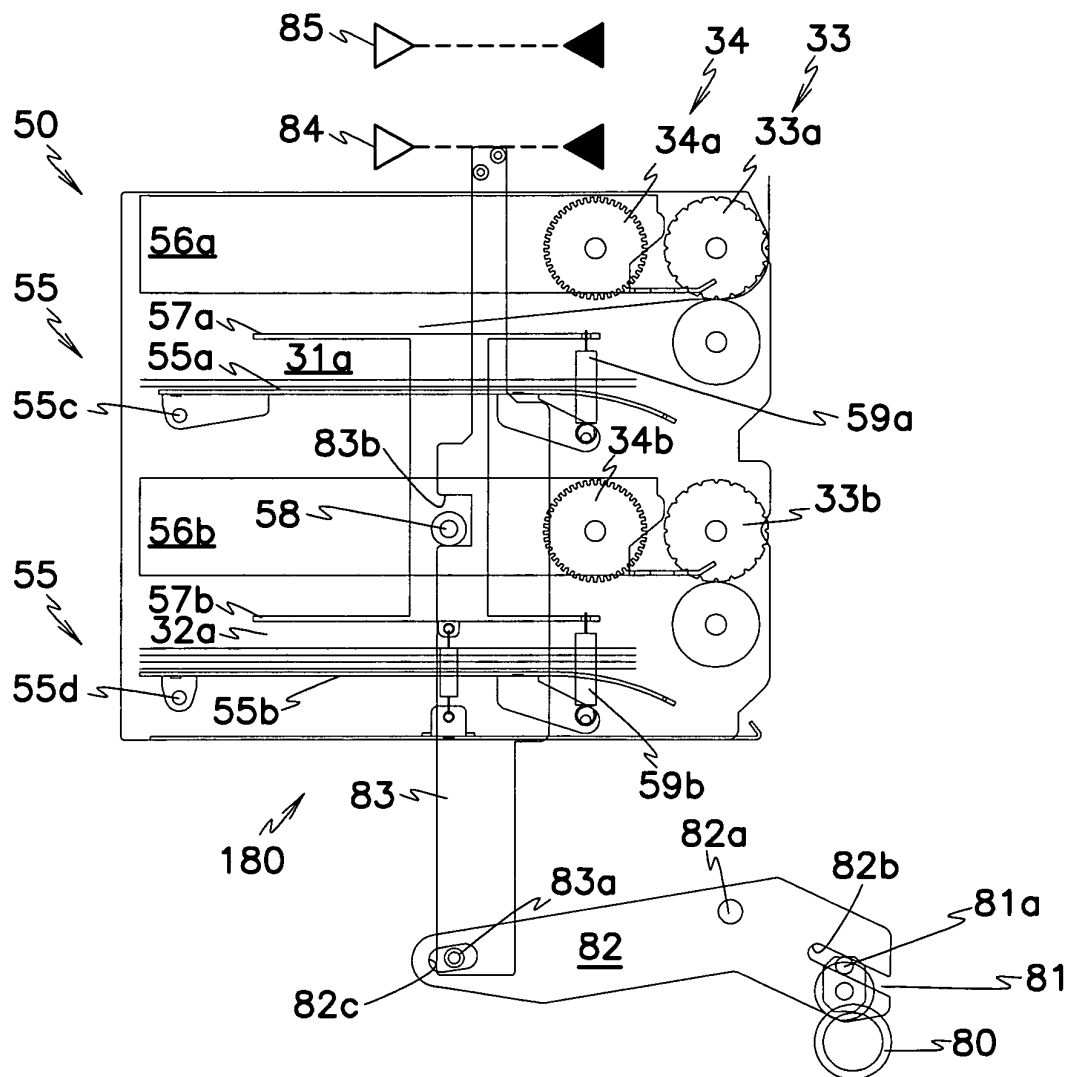


FIG. 10

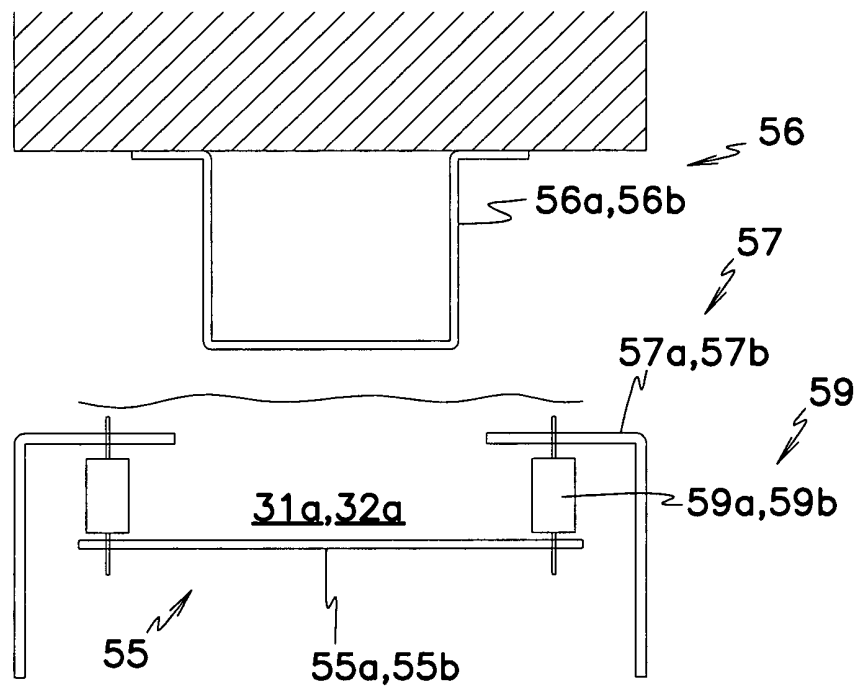


FIG. 11

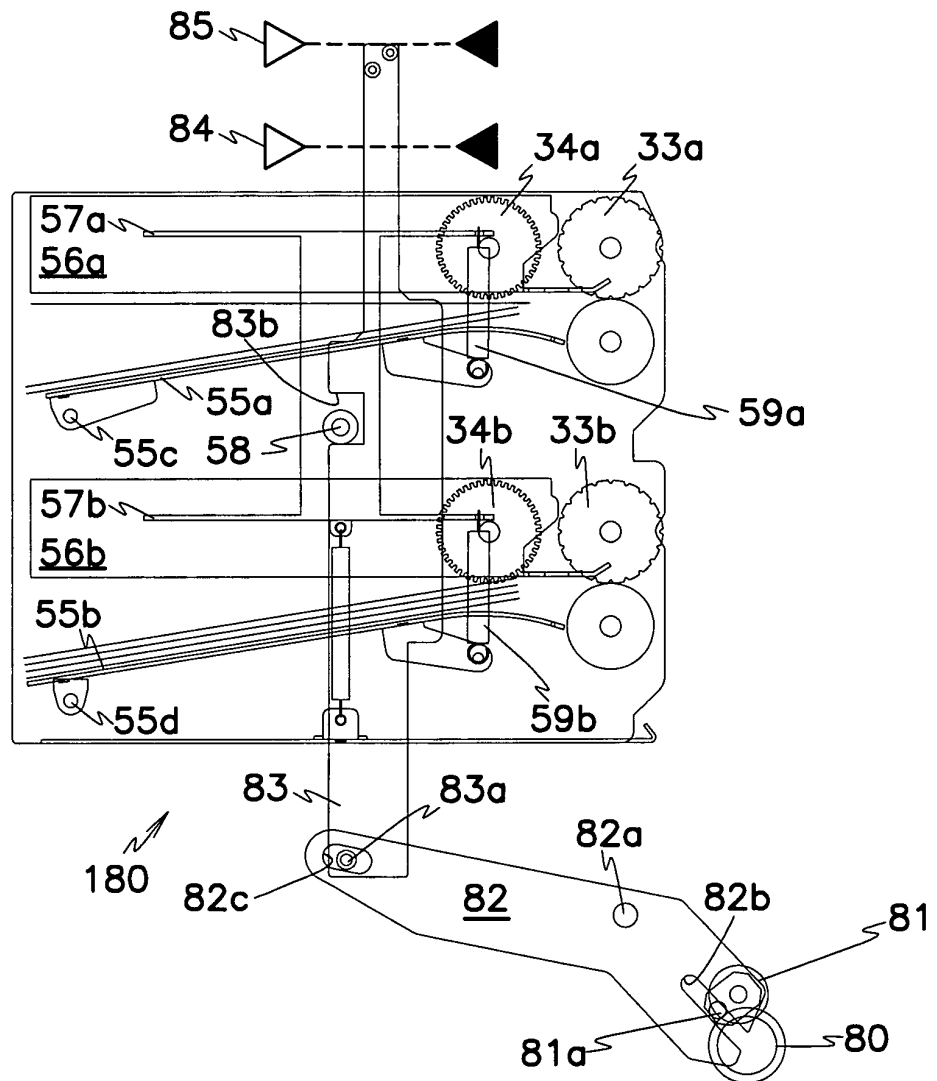


FIG. 12

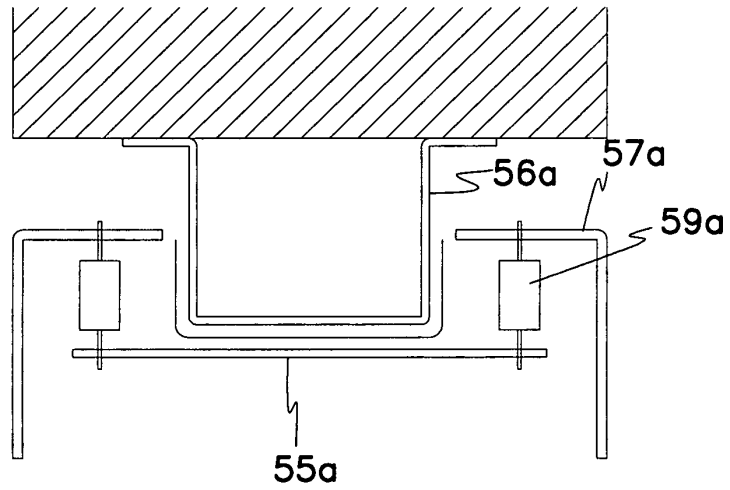


FIG. 13

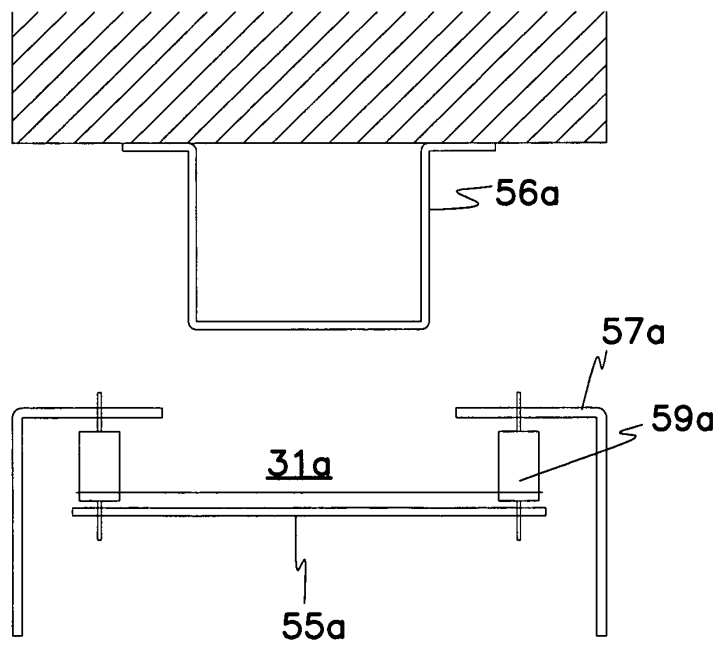


FIG. 14

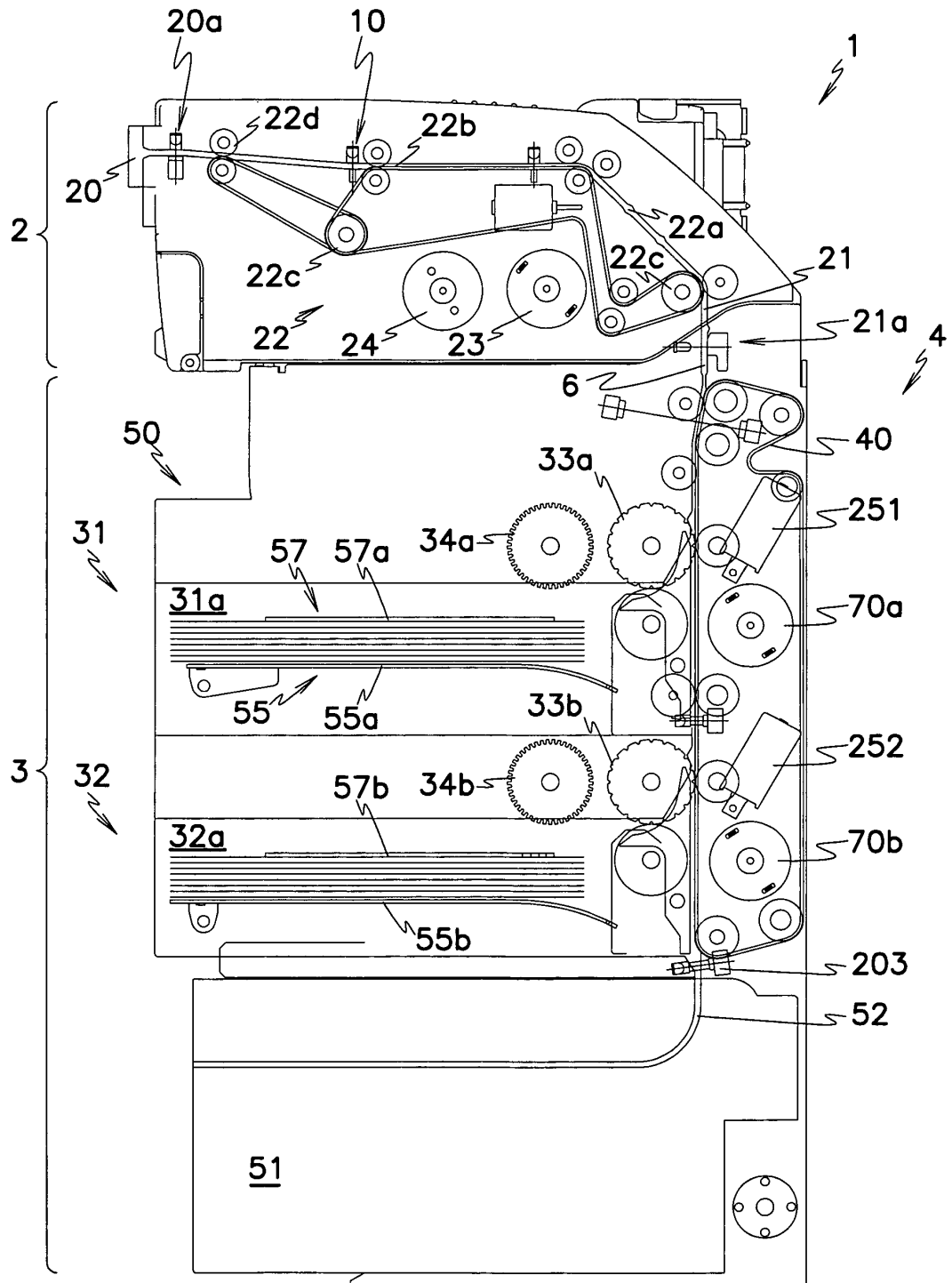


FIG. 15

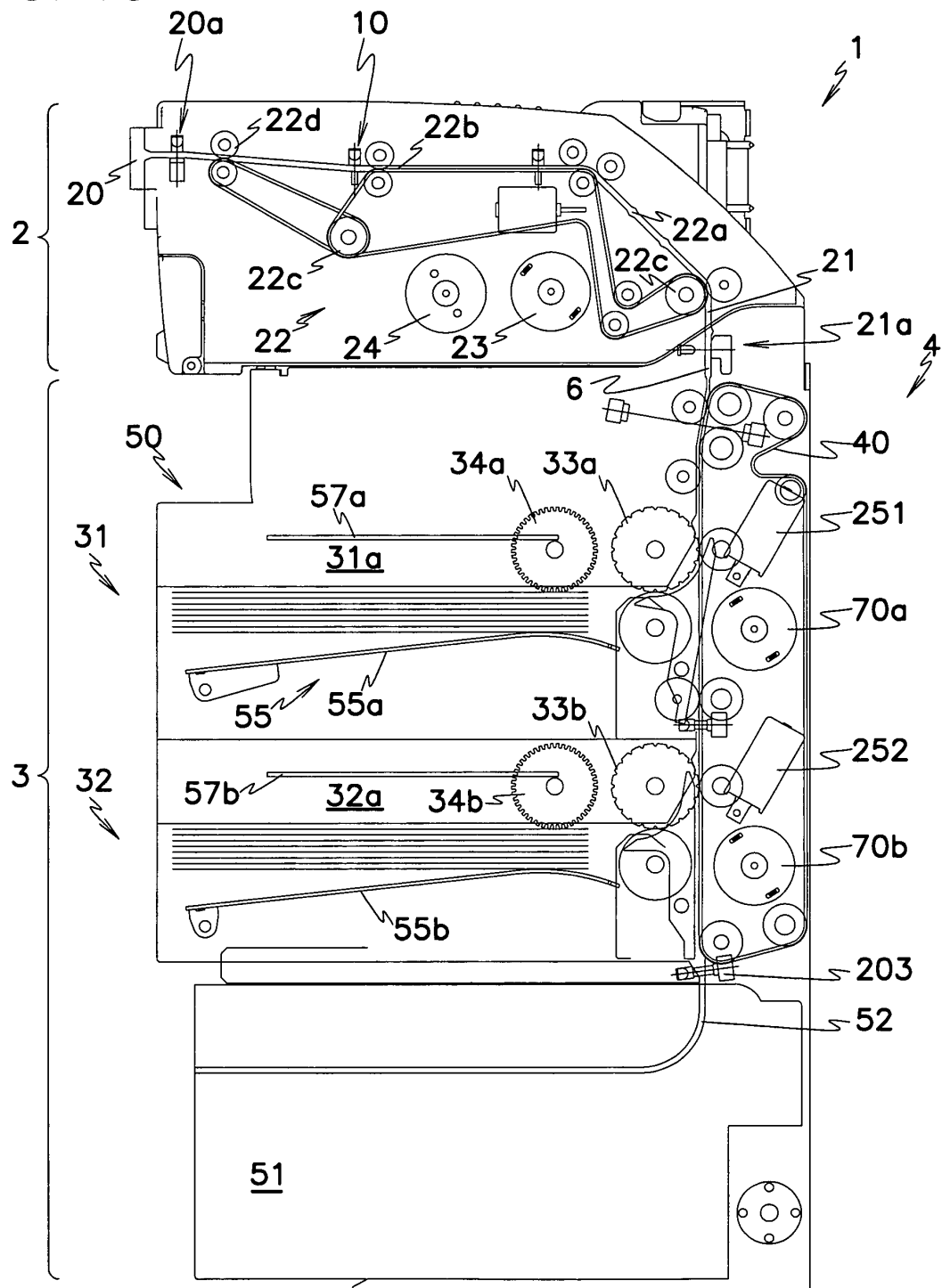


FIG. 16

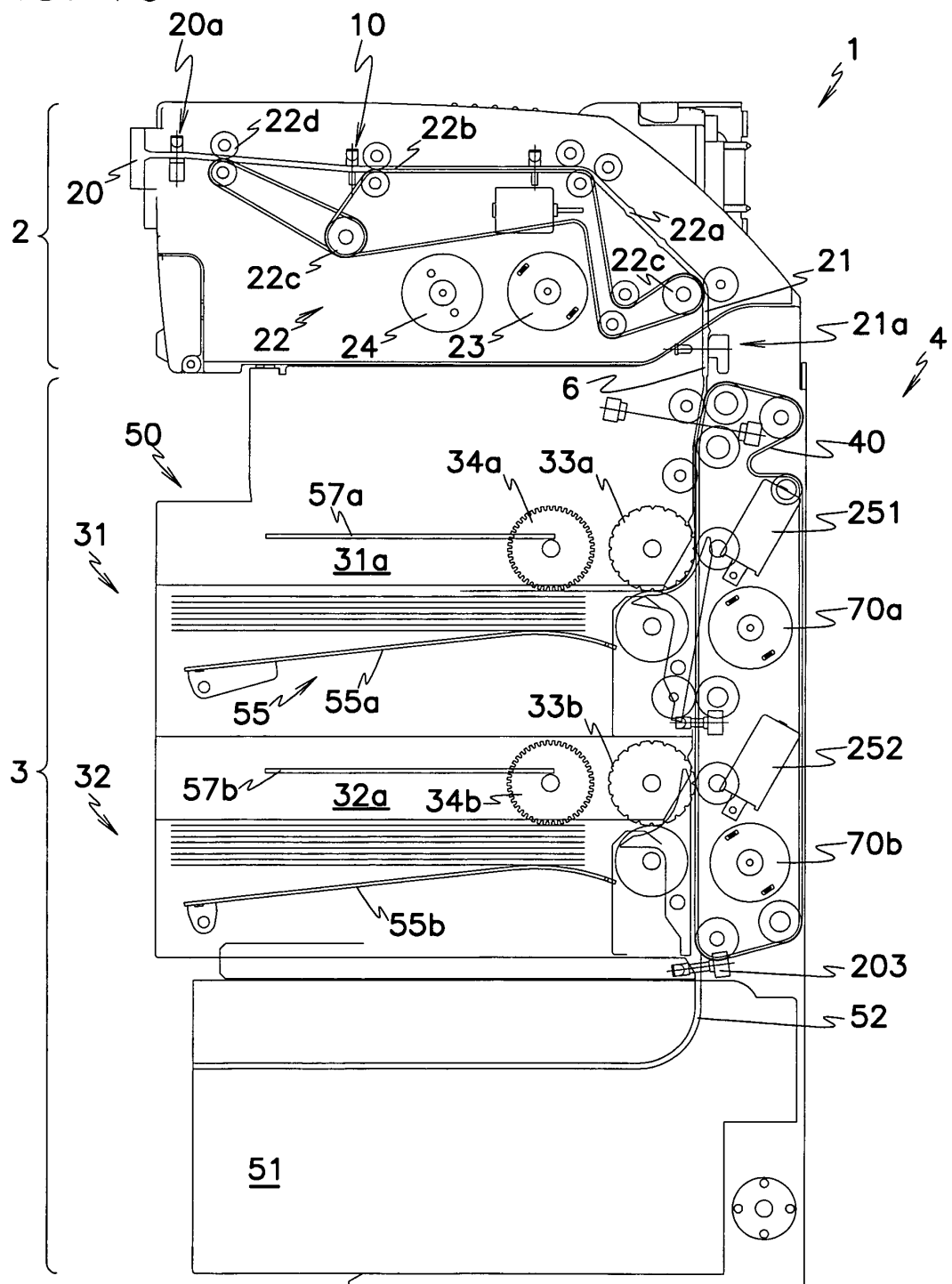


FIG. 17

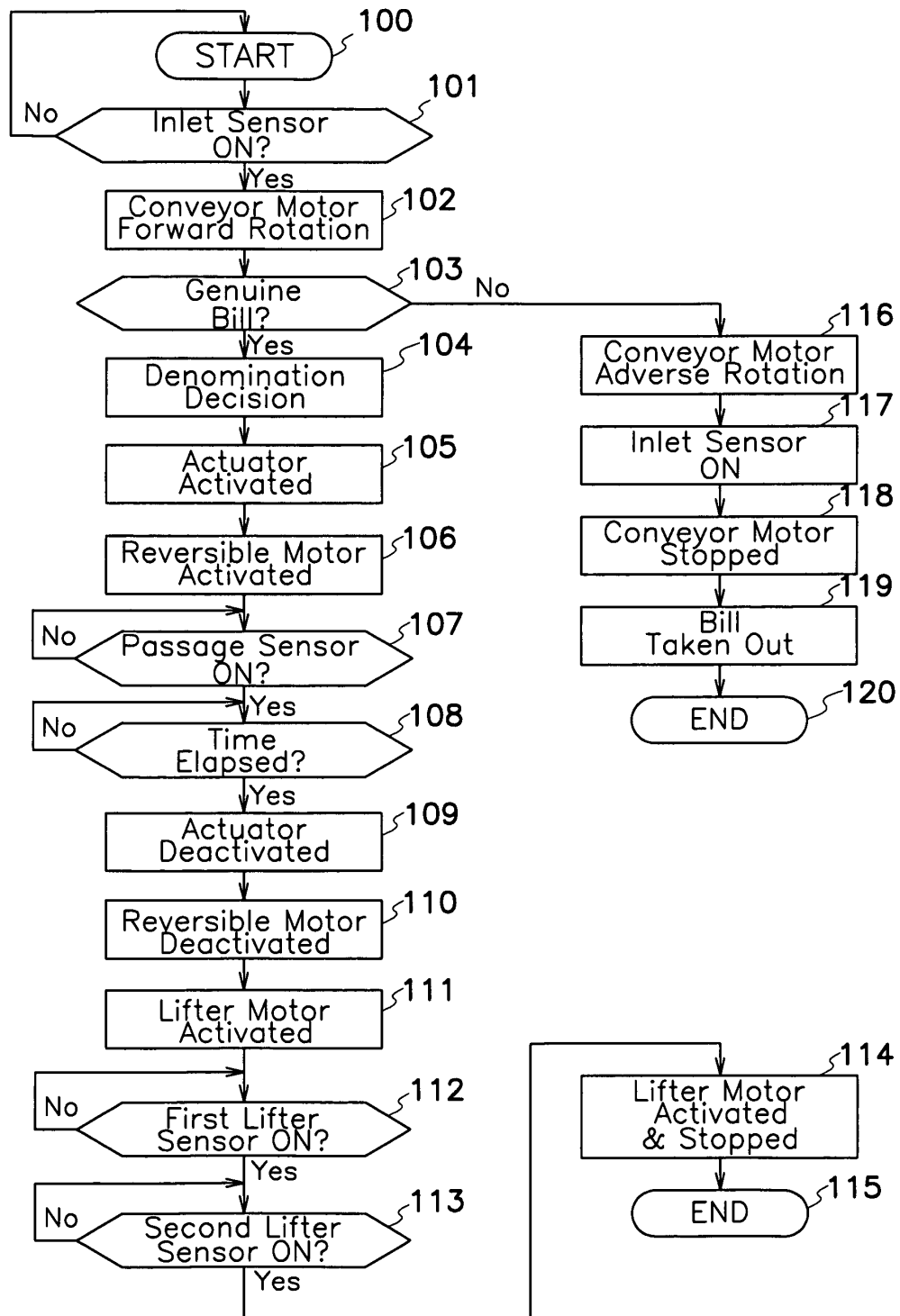


FIG. 18

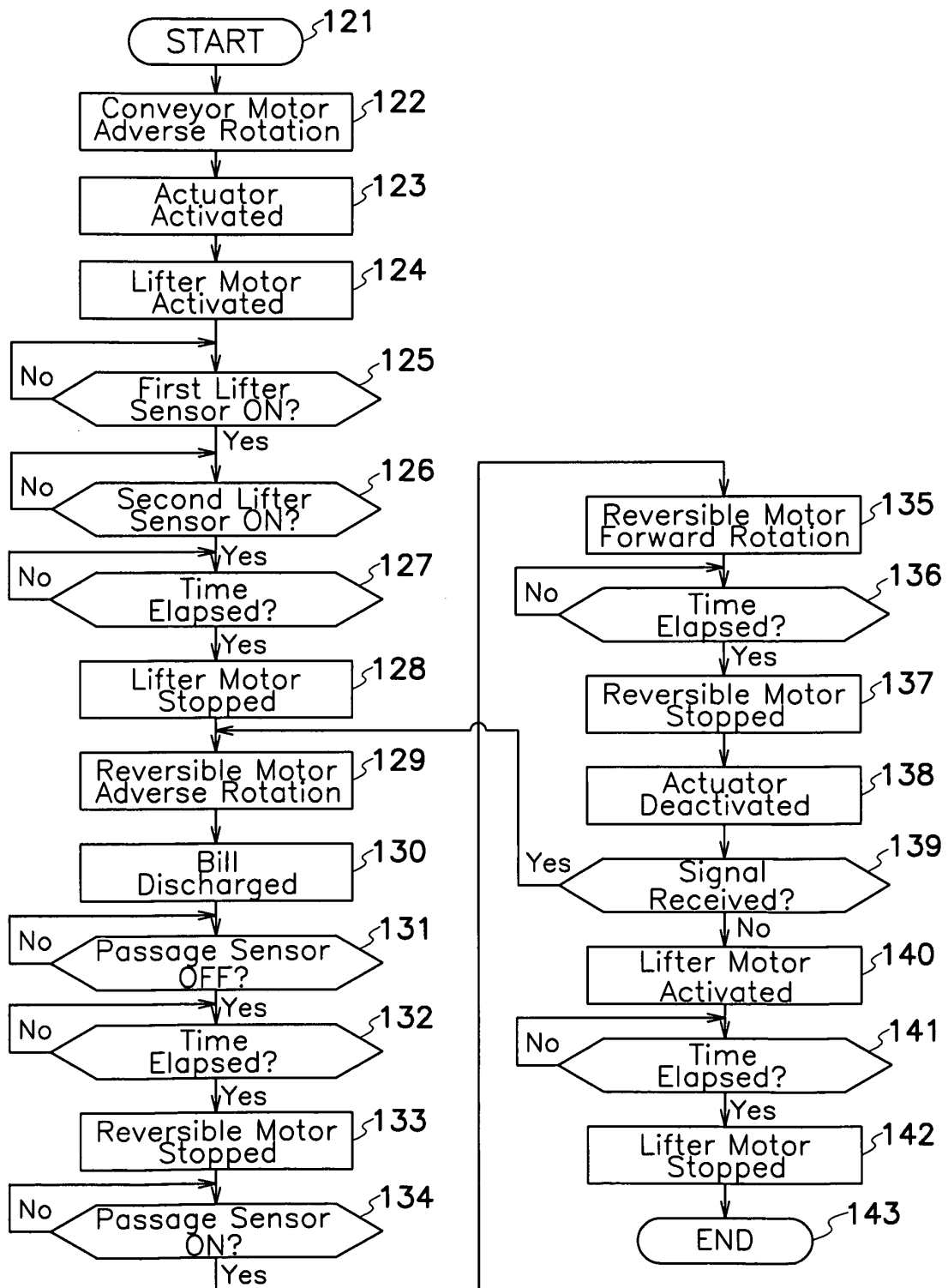


FIG. 19

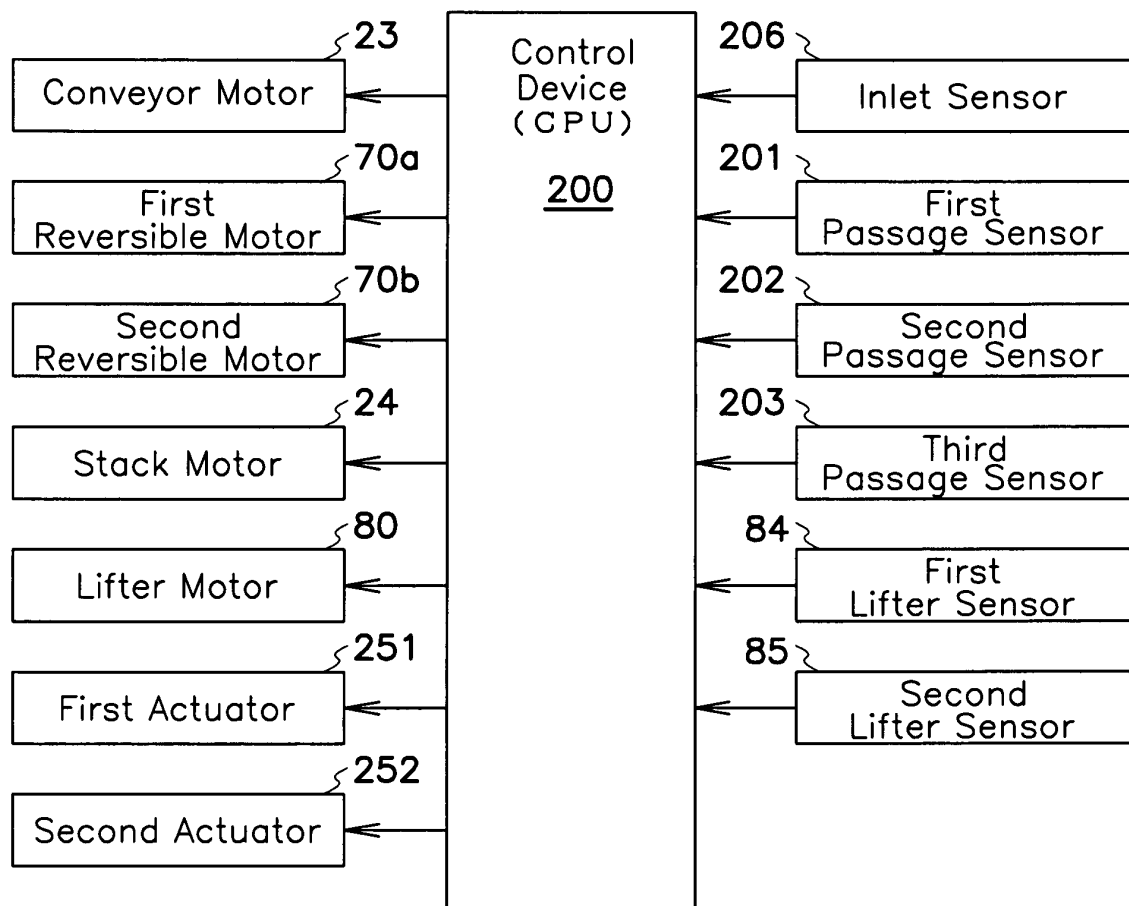


FIG. 20

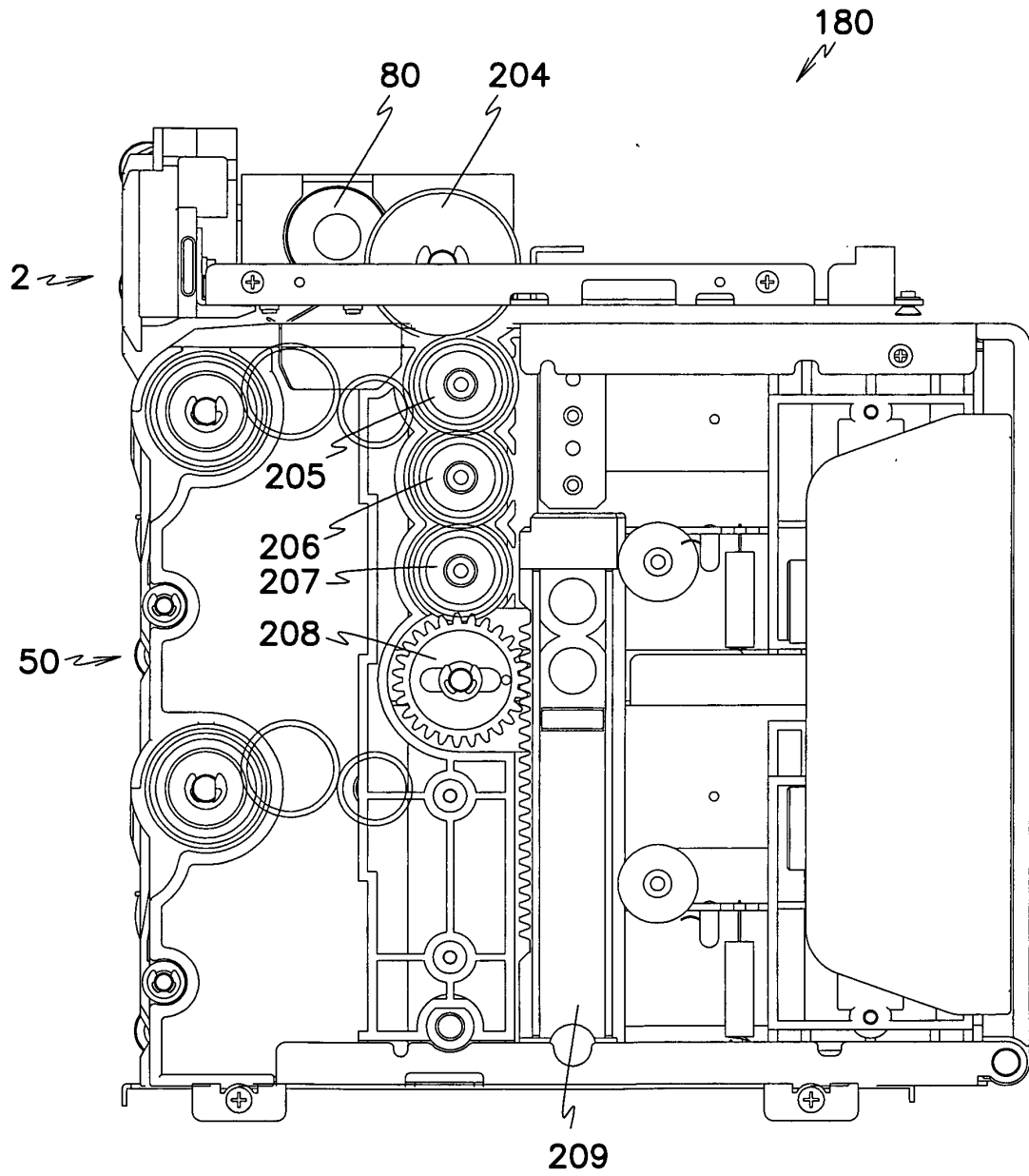


FIG. 21

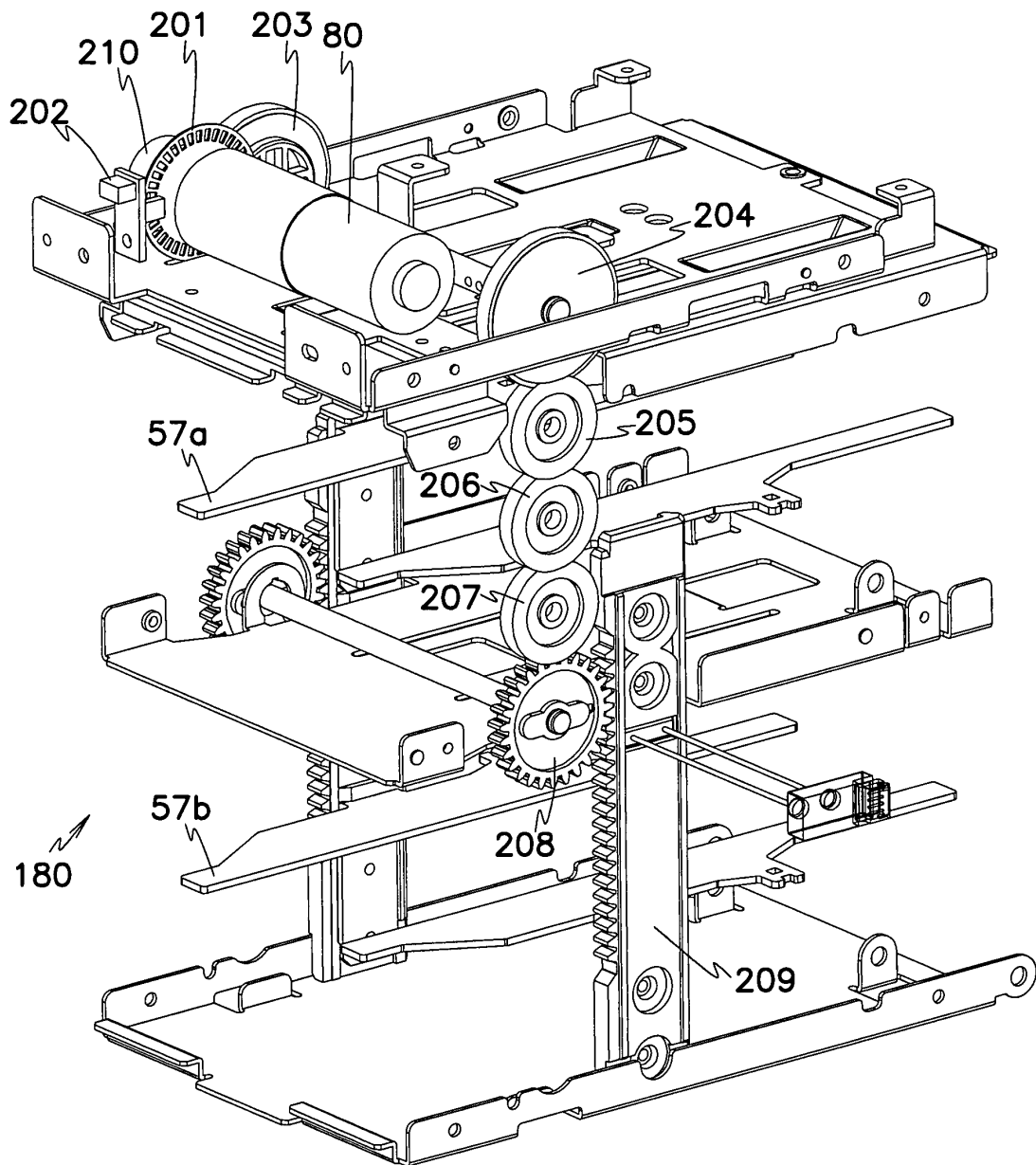
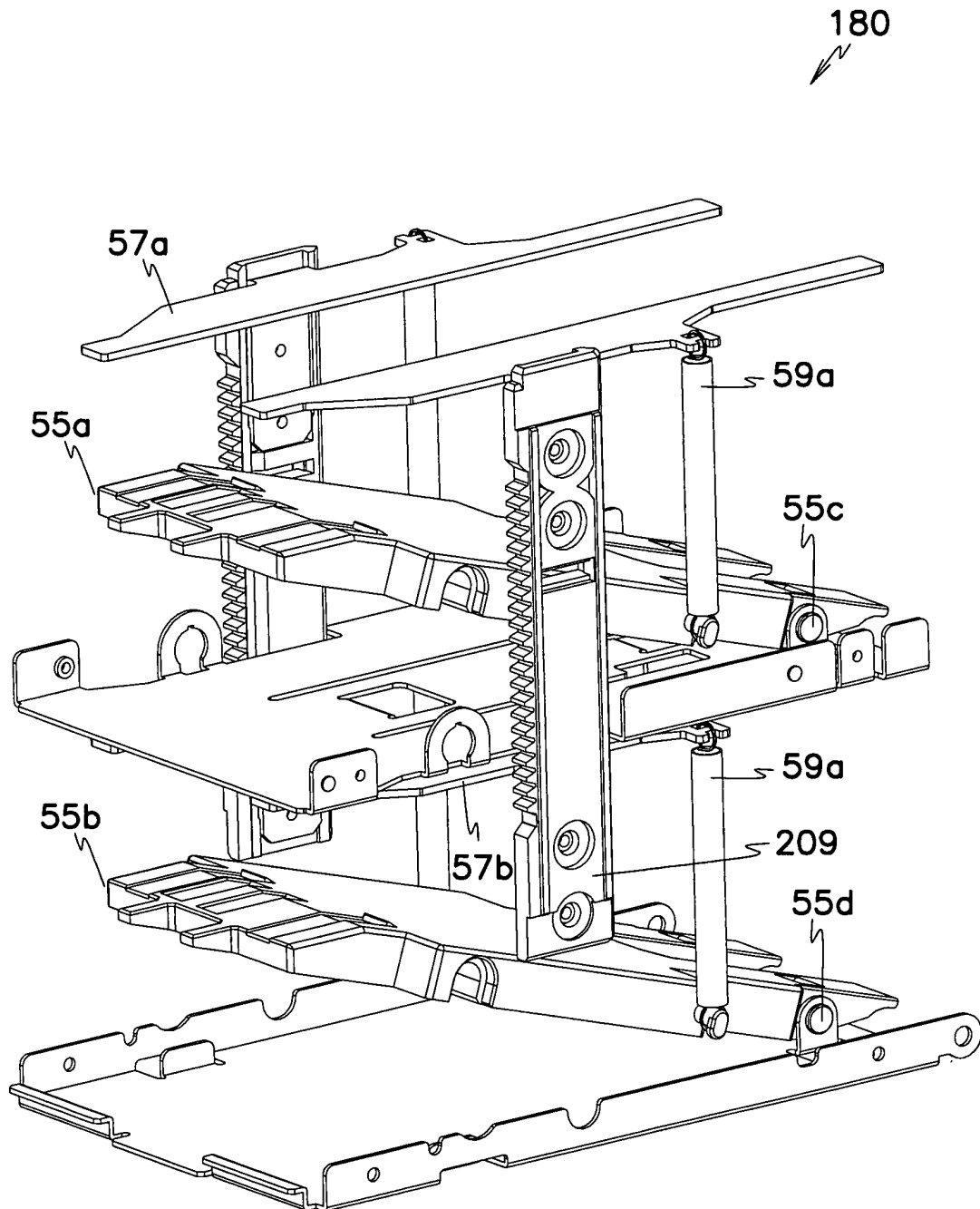


FIG. 22



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2010/000619

A. CLASSIFICATION OF SUBJECT MATTER

G07D9/00 (2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

G07D9/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2010
Kokai Jitsuyo Shinan Koho	1971-2010	Toroku Jitsuyo Shinan Koho	1994-2010

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	JP 2003-346210 A (Japan Cash Machine Co., Ltd.), 05 December 2003 (05.12.2003), paragraphs [0017] to [0038], [0052]; fig. 1, 2, 4, 5, 10 & US 2006/0163030 A1 & EP 1510978 A1 & WO 2003/100735 A1 & CA 2487455 A & BR 311350 A & CN 1666235 A & RU 2302038 C	1, 5-7, 23 2-4, 8-13, 16
Y	JP 11-213207 A (Sanyo Electric Co., Ltd.), 06 August 1999 (06.08.1999), paragraphs [0012], [0013], [0014], [0018], [0026] to [0028]; fig. 2 to 9 (Family: none)	2-4, 8-13, 16



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

21 April, 2010 (21.04.10)

Date of mailing of the international search report

11 May, 2010 (11.05.10)

Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2010/000619

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 9-259342 A (Kubota Corp.), 03 October 1997 (03.10.1997), paragraphs [0019], [0020]; fig. 1 (Family: none)	2-4, 16

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2010/000619

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
See extra sheet.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☒ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
1 - 13, 16, 23
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☒ No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet (2)) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2010/000619

Continuation of Box No.III of continuation of first sheet (2)

The inventions in claims 1, 5 - 6, 23 is not considered to be novel in the light of the invention described in JP 2003-346210 A (Japan Cash Machine Co., Ltd.), 5 December 2003 (05.12.2003), [0017] - [0038], [0052], fig. 1, 2, 4, 5, 10. Furthermore, the invention described in claim 7 is mere alteration of design concerning the invention described in the afore-said document.

Consequently, claims 1, 5 - 7, 23 do not have any special technical feature.

Therefore, five inventions (invention groups) as indicated below are involved in claims of the present application.

Meanwhile, the inventions in claims 1, 5 - 7, 23 having no special technical feature are classified into Invention 1.

(Invention 1) Among the inventions in claims 1, 5 - 7, 23 and the inventions in claims 2 - 4, 11 - 13, 16, 23, the inventions having the following special technical feature.

Paper sheet handling device including a supply roller and a delivery roller

(Invention 2) Among the inventions in claims 8 - 11, 23, the inventions having the following special technical feature.

Paper sheet handling device including the matter described in claim 8.

(Invention 3) Among the inventions in claims 11, 23, the inventions having the following special technical feature.

Paper sheet handling device including the matter described in claim 11.

(Invention 4) Among the inventions in claims 14 - 15, 23, the inventions having the following special technical feature.

Paper sheet handling device including the matter described in claim 14.

(Invention 5) Among the inventions in claims 17 - 23, the inventions having the following special technical feature.

Paper sheet handling device including the matter described in claim 17.

The inventions that may be classified into plural groups among the above-said five groups are deemed to be classified into the firstly appeared group.

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 4158494 A [0004]
- JP 11339100 A [0004]